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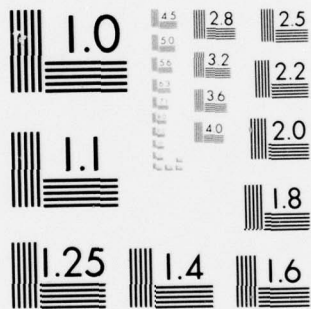
PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6  
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)  
JAN 71 J BOOTH, R DAWSON, A M GRANO

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This appendix is one of a series making up the complete Columbia-North Pacific Region Framework Study on water and related lands. The results of the study are contained in the several documents as shown below:

Main Report

Brochure Report

Appendices

- |  |   |
|--|---|
| I. History of Study                        | IX. Irrigation                          |
| II. The Region                             | X. Navigation                           |
| III. Legal & Administrative Background     | XI. Municipal & Industrial Water Supply |
| IV. Land & Mineral Resources               | XII. Water Quality & Pollution Control  |
| V. Water Resources                         | XIII. Recreation                        |
| VI. Economic Base & Projections            | XIV. Fish & Wildlife                    |
| VII. Flood Control                         | XV. Electric Power                      |
| VIII. Land Measures & Watershed Protection | XVI. Comprehensive Framework Plans      |

Pacific Northwest River Basins Commission  
1 Columbia River  
Vancouver, Washington

1

## Economic Base and Projections

6

### APPENDIX VI

Columbia-North Pacific Region  
Comprehensive Framework Study

of Water and Related Lands. Appendix VI.  
Economic Base and Projections,

10  
John Booth, Robert Dawson,  
Anthony M. Grano, Adrian Hutchins  
Norman S. Petersen

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APPENDIX VI  
Economic Base & Projections

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This appendix to the Columbia-North Pacific Region Framework Report was prepared at field level under the auspices of the Pacific Northwest River Basins Commission. It is subject to review by the interested Federal agencies at the departmental level, by the Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration.

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## INTRODUCTION

### PURPOSE AND SCOPE

The Economic Base and Projections Appendix is one of the five major components of the Columbia-North Pacific Framework Study. The purpose of this appendix is to provide basic inputs for the evaluation of present and future needs for water and related land resources and the formulation of framework plans for the management, use, and development of these resources. In addition, the report provides a basis for evaluation of the impacts of alternative resource developments on economic activity. The major elements of the study are as follows:

(1) Inventory and analysis of economic activity and population in the study area, its linkage with related economic activity exogenous to the region, and analysis of significant relationships between economic activity and the quality and quantity of available natural resources, and

(2) Projections of economic activity and population in the region based upon specific assumptions of national economic growth and the availability and quality of resources within and outside the geographic area of concern.

The Columbia-North Pacific Region, as defined for purposes of this water resource study, occupies about 274,000 square miles of the northwestern corner of the conterminous United States, commonly known as the Pacific Northwest. The region includes all of the Columbia River Basin in the United States, those basins in Oregon and Washington draining into the Pacific Ocean, the Straits of Georgia or Juan de Fuca within Washington, and that part of the Great Basin lying in Oregon. Some 39,500 square miles of the upper Columbia River drainage lie in Canada and are not included in the study area.

The region encompasses all of the State of Washington, most of Oregon and Idaho, that part of Montana west of the Continental Divide, and portions of Utah, Wyoming, and Nevada that are drained by tributaries of the Columbia River. The area amounts to almost 8 percent of the conterminous United States. Of the 20 regions slated for study under the Water Resources Planning Act, it is the third largest, being exceeded only by the Missouri and Arkansas-White-Red.

On the east, the area is bounded by the Continental Divide of the Rocky Mountains, on the north by the Canadian border, and on

the west by the Pacific Ocean. Its southern boundary is the southern rim of the Snake River Basin and the Oregon State line, except the Oregon portion of the Goose Lake, Klamath, and Smith River drainages which are excluded.

The boundaries for the Economic Base Study, together with the hydrologic subregion boundaries, are shown in figure 1. The economic study area is comprised of 126 counties located in Idaho, Oregon, Washington, Western Montana, and Wyoming. These counties have been divided into 12 subregions, which approximate the hydrological subregions for study purposes. There is, therefore, no major economic significance to the subregion delineations. Data and information utilized in the economic base study, as well as projected data, are based on county data, unless otherwise specified.

#### RELATIONSHIP TO OTHER PARTS OF THE FRAMEWORK STUDY

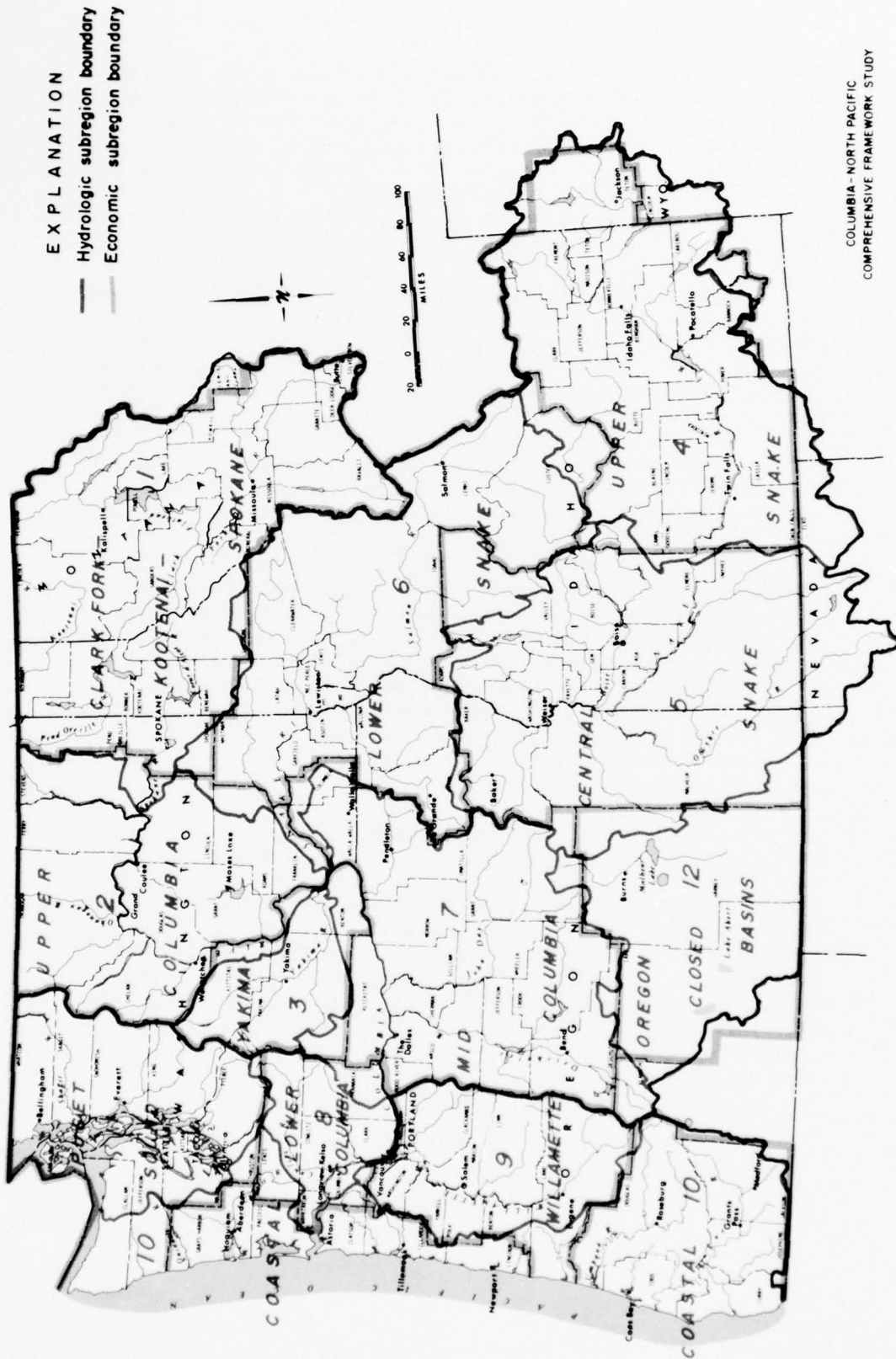
Appendix VI, Economic Base and Projections, is one of three basic appendices used in preparing the nine functional appendices, the comprehensive framework plan, and the main reports. The other two basic appendices are Land and Mineral Resources, and Water Resources.

The economic base study provides a basis for the appraisal of current and long-term problems and aids in assessing the need for water and related land resources. The study provides data concerning past and present economic activity in the region and subregions, and projections of population growth and economic development for the years 1980, 2000, and 2020. These economic and demographic projections will be translated into the demands and/or needs for water and related land resources. The translation into needs is being accomplished in the nine functional appendices. Consequently, the economic base study, the other two basic appendices, and the nine functional appendices will provide the inputs for the formulation of framework plans that will serve as a broad guide for the management, use, and development of the region's water and related land resources to meet short and long-term needs.

#### METHODS OF ANALYSIS

Much of the analysis and projections incorporated in this study has been prepared by the Office of Business Economics of the Department of Commerce and the Economic Research Service and Forest Service of the Department of Agriculture in accordance with an agreement executed by the Water Resources Council.





COLUMBIA-NORTH PACIFIC  
COMPREHENSIVE FRAMEWORK STUDY

THE REGION  
1968

FIGURE 1

However, other agencies participating in the study have made substantial contributions to the study, utilizing, to the extent possible, the numerous economic studies which are underway or completed by the various private, state, and federal agencies and institutions (especially the Bonneville Power Administration Economic Base Study). Description of the methods of analysis used in various portions of the study is included in later sections of this report.

Generally, the projections for the Columbia-North Pacific Region and subregions were developed as part of a national study which made national projections which were then disaggregated into small area projections. <sup>1/</sup> The regional projections were developed by first projecting income and employment, and then population, as follows:

1. Income and employment: The country was divided into 167 economic areas consisting of urban centers and their surrounding areas. Historical series of income and employment were developed for these areas from county data. The components of income and employment for each of these areas were then expressed as percents of the corresponding national total, and historical trends in these percentage shares were analyzed and projected. These component projections were compared and adjustments were made as necessary, then they were applied to the national projections which had been independently developed to arrive at economic area projections. The economic area projections were then apportioned among their constituent counties and regrouped to obtain projections for water resource areas (subregions).

2. Population: Economic area population was assumed to be a function of area employment plus an adjustment to take into account the fact that selected areas attract an especially large number of retired persons. Historical population/employment ratios for each area were adjusted for full employment conditions and trends in these ratios were projected to approach the projected national average ratio. Application of these ratios to area employment projections together with the adjustment for migration of retirees yielded economic area population projections which were then re-allocated to water resource areas as for income and employment.

---

<sup>1/</sup> A detailed description of the methodological procedures and assumptions in the National-Regional projections program can be found in the following publications: (64), (67), (74).

## ASSUMPTIONS

Certain assumptions regarding the probable direction and levels of national economic growth must necessarily be adopted for general guidance in any set of projections. These anticipated trends and conditions set the broad framework of economic development potential of sub-national areas. While all assumptions may not be fully realized, the specific identification of these constraints will permit adjustments to be made as conditions change.

The population and economy of the nation will continue to grow during the projection period. National population totals used are from the Series C projections published by the Bureau of the Census in Projections of the Population of the United States by Age and Sex: 1964 to 1985 with Extensions to 2010, Population Estimates Series P-25, No. 286, July 1964. The 2010 figures in this publication were extended to 2020 in accordance with the projected average rate of growth from 1960 to 2010.

Nationwide labor force figures were calculated by applying to projected population the labor force participation rates. Total labor force is assumed to increase at a rate of 1.4 percent as compared to a population rise of 1.3 percent.

National totals of all-industry employment were derived from the labor force projections by assuming a four percent rate of unemployment in the target years.

Total gross national product was derived as the product of projected employment and projected productivity per man. The derived rate of growth in gross national product over the span 1965 to 2020 is four percent per year. Hours worked per person in the private economy are assumed to decline from an average of 2020 in year 1965 to 1749 in 2020.

National personal income was derived from the projected gross national product on the basis of past trends in the relationship between the two.

National totals of employment and of personal income by industry were derived from the projected totals of gross national product and personal income on the basis of 1947-63 trends of productivity, industrial structure of national output, and composition of income. These were allocated by industry to the regions and from them was derived regional population.

The explicit assumptions are:

1. Sufficient quantities of water of acceptable quality will be available by timely development to avoid being a constraint to economic growth.
2. The Federal Government, as a matter of national policy, will actively support programs designed to stimulate economic growth.
3. There will be no general war or any appreciable cessation of the cold war throughout the period to 1980. Expenditures on national security will continue to account for approximately 10 percent of gross national product.
4. There will be a continued relaxation of trade tariffs and quotas accompanied by an expansion in international commerce.

Table 1 contains the summary national totals used in developing the industrial breakdowns required for the regional disaggregations.

A comparison of the economic projections developed for this appendix with respect to assumptions and methodology are compared with the two Type 2 studies conducted in the Puget Sound and Willamette Subregions in an Addendum starting on page 183. In addition to detailed discussions concerning the assumptions and methodology of each study, the Addendum shows projected differences for total employment, population, and per capita incomes.



Table 1 - Selected National Aggregates

| Year      | Population                                 |   |   | Civilian                           |                                    |  | Unemploy-<br>ment<br>Rate<br>(BLS) | Civilian<br>Employment<br>(BLS)<br>(Thou.) |
|-----------|--|---|---|------------------------------------|------------------------------------|--|------------------------------------|--|
|           | Total<br>Population<br>(Census)<br>(Thou.) | 14 Years Old<br>and Over<br>(Census)<br>(Thou.) | Labor Force<br>Participa-<br>tion Rates<br>(Computed) | Labor<br>Force<br>(BLS)<br>(Thou.) | Labor<br>Force<br>(BLS)<br>(Thou.) | Civilian<br>Employment<br>(BLS)<br>(Thou.) |                                    |  |
| 1950      | 152,271                                    | 113,438   | .571  | 64,749                             | 63,099                             | 59,957                                     | .053                               | 59,957                                     |
| 1955      | 165,931                                    | 119,440   | .577  | 68,896                             | 65,848                             | 63,193                                     | .044                               | 63,193                                     |
| 1960      | 180,684                                    | 127,335   | .574  | 73,126                             | 70,612                             | 66,681                                     | .056                               | 66,681                                     |
| 1965      | 194,592                                    | 138,261   | .567  | 78,357                             | 75,635                             | 72,179                                     | .046                               | 72,179                                     |
| Rate      |  |   |   |                                    |                                    |  |                                    |  |
| 1950-1965 | 1.6%                                       | 1.3%  |   | 1.3%                               | 1.2%                               | 1.3%                                       |                                    | 1.3%                                       |
| 1980      | 235,212 $\frac{1}{-}$                      | 174,234 $\frac{1}{-}$                           | .578  | 100,707                            | 98,107                             | 94,183                                     | .040                               | 94,183                                     |
| 2000      | 307,803 $\frac{1}{-}$                      | 227,470 $\frac{1}{-}$                           | .583  | 132,615                            | 130,015                            | 124,814                                    | .040                               | 124,814                                    |
| 2020      | 398,642 $\frac{1}{-}$                      | 294,956 $\frac{1}{-}$                           | .583  | 171,959                            | 169,359                            | 162,585                                    | .040                               | 162,585                                    |
| Rate      |  |   |   |                                    |                                    |  |                                    |  |
| 1965-2020 | 1.3%                                       | 1.4%  |   | 1.4%                               | 1.5%                               | 1.5%                                       |                                    | 1.5%                                       |

(continued)

Table 1 - Selected National Aggregates -- Cont'd.

| Year      | Civilian Government Employment (BLS) (Thou.) | Civilian Private Employment (BLS) (Thou.) | Private Economy Hours per Man Year (BLS) | Private Economy Product per Man Hour (Computed) (1958 dol.) | Private Economy Gross Product (Computed) (Mil.) (1958 dol.) | Gross National Product (Computed) (Mil.) (1958 dol.) |
|-----------|--|---|--|---|---|--|
| 1950      | 5,817  | 54,140                                    | 2,125                                    | 2.79  | 319,410   | 355,288  |
| 1955      | 6,838  | 56,355                                    | 2,091                                    | 3.34  | 392,007   | 437,963  |
| 1960      | 7,943  | 58,738                                    | 2,026                                    | 3.68  | 438,523   | 487,682  |
| 1965      | 9,623  | 62,556                                    | 2,020                                    | 4.42  | 558,671   | 616,659  |
| Rate      |  |   |  |   |   |  |
| 1950-1965 | 3.4%   | 1.0%                                      | -0.3%                                    | 3.1%  | 3.8%  | 3.7%   |
| 1980      | 14,365                                       | 79,818                                    | 1,949                                    | 6.89  | 1,071,474   | 1,151,794  |
| 2000      | 22,232                                       | 102,582                                   | 1,850                                    | 12.44   | 2,361,517   | 2,479,538  |
| 2020      | 33,122                                       | 129,463                                   | 1,749                                    | 22.47   | 5,087,660   | 5,257,745  |
| Rate      |  |   |  |   |   |  |
| 1965-2020 | 2.3%   | 1.3%                                      | -0.26%                                   | 3.0%  | 4.1%  | 4.0%   |

(continued)

Table 1 - Selected National Aggregates -- Cont'd.

| Year      | Total Man-<br>power Civil-<br>ian Plus<br>Military<br>(BLS)<br>(Thou.) | Product<br>per Man<br>(Computed)<br>(1958 dol.) | Product<br>per Capita<br>(Computed)<br>(1958 dol.) | Total<br>Personal<br>Income<br>(OBE)<br>(Mil.)<br>(1958 dol.) | Personal<br>Income<br>per Capita<br>(OBE)<br>(1958 dol.) | Domestic<br>Personal<br>Income<br>(OBE)<br>(Mil.)<br>(1958 dol.) | Domestic<br>Earnings<br>(OBE)<br>(Mil.)<br>(1958 dol.) |
|-----------|--|---|--|---|--|--|--|
| 1950      | 61,607   | 5,767   | 2,333  | 274,571   | 1,803  | 272,820  | 225,084  |
| 1955      | 66,241   | 6,612   | 2,639  | 335,010   | 2,019  | 332,108  | 277,573  |
| 1960      | 69,195   | 7,048   | 2,699  | 389,653   | 2,157  | 387,447  | 317,575  |
| 1965      | 74,901   | 8,233   | 3,169  | 494,719   | 2,542  | 491,979  | 396,867  |
| Rate      |  |   |  |   |  |  |  |
| 1950-1965 | 1.3%   | 2.4%  | 2.1%   | 4.0%  | 2.3%   | 4.0%   | 3.9%   |
| 1980      | 96,783   | 11,901  | 4,897  | 967,104   | 4,112  | 963,000  | 750,237  |
| 2000      | 127,414  | 19,460  | 8,056  | 2,204,086   | 7,161  | 2,196,684  | 1,672,112  |
| 2020      | 165,185  | 31,829  | 13,189   | 4,947,748   | 12,412   | 4,934,146  | 3,721,948  |
| Rate      |  |   |  |   |  |  |  |
| 1965-2020 | 1.4%   | 2.5%  | 2.6%   | 4.3%  | 2.9%   | 4.3%   | 4.2%   |

1/ Except for these figures, all projected values are those of the Office of Business Economics.  
Source: U.S. Department of Commerce, Office of Business Economics.

СС-10-ДЕН-20-ГА-СРД

CHARACTERISTICS OF POPULATION  
AND THE ECONOMY

POPULATION

Total

The Columbia-North Pacific Region had a total population of slightly over 5,426,000 in 1960 (table 2). This was an increase of more than 56 percent over the 1940 population. However, the rate of growth was not uniform throughout the time period. Between 1940 and 1950 the population increased by 33 percent, but growth was only 18 percent between 1950 and 1960. These figures compare with national rates of growth of 14 percent for the first decade and 19 percent for the second. These relationships are illustrated in figure 2.

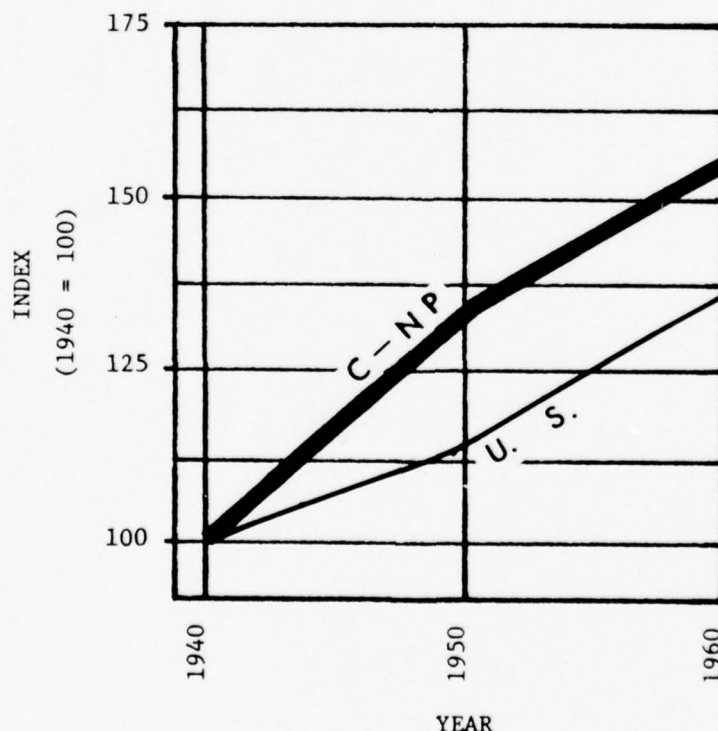


FIGURE 2. Index of Population Growth, United States and Columbia-North Pacific Region.



Table 2 - Population, Columbia-North Pacific Region and Subregions, and United States, 1900 to 1965

| Subregion | 1900        | 1910    | 1920    | 1930    | 1940    | 1950    | 1960    | 1965    |
|-----------|-------------|---------|---------|---------|---------|---------|---------|---------|
|           | (Thousands) |         |         |         |         |         |         |         |
| 1         | 180.2       | 326.1   | 361.8   | 378.0   | 417.4   | 489.4   | 563.7   | 595.1   |
| 2         | 45.9        | 109.6   | 112.6   | 112.0   | 130.1   | 157.4   | 193.6   | 198.6   |
| 3         | 23.2        | 68.2    | 92.4    | 106.5   | 131.3   | 209.3   | 227.6   | 236.7   |
| 4         | 45.6        | 109.0   | 184.4   | 187.8   | 217.8   | 242.5   | 277.2   | 302.0   |
| 5         | 56.0        | 106.3   | 130.9   | 136.4   | 178.3   | 215.3   | 252.4   | 268.2   |
| 6         | 96.1        | 131.7   | 132.8   | 130.3   | 137.3   | 148.9   | 156.0   | 163.3   |
| 7         | 86.6        | 123.5   | 128.8   | 130.1   | 143.2   | 184.9   | 198.7   | 210.5   |
| 8         | 47.2        | 87.6    | 101.2   | 139.1   | 161.3   | 214.0   | 224.5   | 240.1   |
| 9         | 233.3       | 416.4   | 496.3   | 609.9   | 691.2   | 992.4   | 1,168.9 | 1,338.9 |
| 10        | 89.9        | 151.1   | 172.2   | 215.8   | 235.6   | 328.8   | 381.4   | 405.5   |
| 11        | 264.5       | 607.2   | 772.5   | 909.9   | 1,007.1 | 1,418.4 | 1,768.1 | 1,904.1 |
| 12        | 5.4         | 8.7     | 8.0     | 10.8    | 11.7    | 12.8    | 13.9    | 13.3    |
| C-NP      | 1,174.0     | 2,245.3 | 2,693.9 | 3,066.4 | 3,462.3 | 4,614.0 | 5,426.1 | 5,876.1 |
|           | (Millions)  |         |         |         |         |         |         |         |
| U.S.      | 76.1        | 92.4    | 106.5   | 123.2   | 132.2   | 151.3   | 179.3   | 194.0   |

Source: Estimated from Census of Population.

Although a rate of growth slightly less than the national average was the general condition for the Columbia-North Pacific Region from 1950 to 1960, there were two exceptions. Subregions 2 and 11 both experienced larger percentage increases than the national average. The increase in subregion 11 (Puget Sound) is typical of the population trends for such industrial centers. Subregion 2 is a different situation. It is primarily a rural area containing relatively small agricultural communities. It is areas such as these that generally have not kept pace proportionately with national increases in population. However, the whole subregion experienced a 23 percent increase in population between 1950 and 1960. The increase was not uniform throughout the subregion. That part of the subregion contained in the Columbia Basin irrigation development project experienced a 114 percent increase (77). The remainder of the subregion had a net decrease in population.

The distribution of population within the region by urban, rural, and rural non-farm classifications has closely followed the national pattern. The trend has generally been an increase in urban, a decrease in rural-farm, and on the average, a relatively stable rural non-farm population. Comparisons of these trends are illustrated in figure 3. Detailed data on population characteristics of the region are contained in table 3. Approximately 61 percent of the population in the region is concentrated west of the Cascades (figure 4).

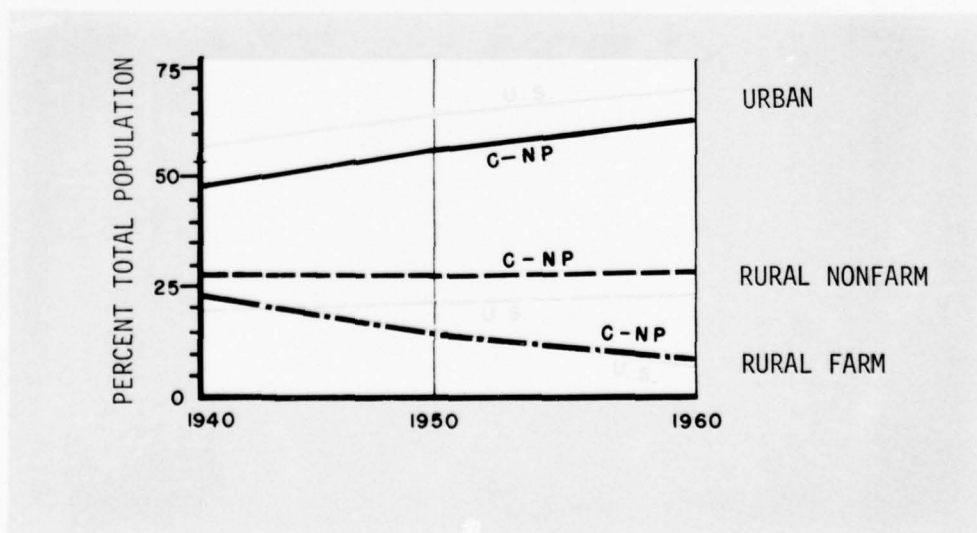


Figure 3. Percent Urban, Rural Non-Farm and Rural Farm of Total Population, United States and Columbia-North Pacific Region.

Table 3 - Population Characteristics 1940, 1950 and 1960, Columbia-North Pacific Region and Subregions

| Item               | U.S.<br>1/  | C-NP      | P O P U L A T I O N |         |         |         |         |         |         |         |           |         |           |        |
|--------------------|-------------|-----------|---------------------|---------|---------|---------|---------|---------|---------|---------|-----------|---------|-----------|--------|
|                    |             |           | SUBREGIONS          |         |         |         |         |         |         |         |           |         |           |        |
|                    |             |           | 1                   | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9         | 10      | 11        | 12     |
| 1940 Total         | 131,669,235 | 3,462,344 | 417,414             | 130,130 | 131,302 | 217,772 | 178,305 | 137,338 | 143,194 | 161,290 | 691,204   | 235,612 | 1,007,116 | 11,667 |
| Urban              | 74,423,702  | 1,684,723 | 225,139             | 22,110  | 36,848  | 72,137  | 68,632  | 34,695  | 49,549  | 58,930  | 403,387   | 89,593  | 621,137   | 2,566  |
| % of Total         | 57          | 49        | 54                  | 17      | 28      | 33      | 38      | 25      | 35      | 36      | 58        | 38      | 62        | 22     |
| Rural Farm         | 30,216,188  | 812,736   | 81,140              | 50,557  | 46,666  | 92,049  | 66,983  | 51,733  | 47,751  | 51,113  | 130,522   | 57,679  | 133,114   | 3,429  |
| % of Total         | 23          | 23        | 19                  | 39      | 36      | 42      | 38      | 38      | 33      | 32      | 19        | 24      | 13        | 29     |
| Rural Nonfarm      | 27,029,385  | 964,885   | 111,135             | 57,463  | 47,788  | 53,586  | 42,690  | 50,910  | 45,894  | 51,247  | 157,295   | 88,340  | 252,865   | 5,672  |
| % of Total         | 20          | 28        | 27                  | 44      | 36      | 25      | 24      | 37      | 32      | 32      | 23        | 38      | 25        | 49     |
| 1950 Total         | 150,697,361 | 4,614,026 | 489,391             | 157,388 | 209,328 | 242,522 | 215,258 | 148,850 | 184,891 | 214,021 | 992,387   | 328,806 | 1,418,422 | 12,762 |
| % Change from 1940 | 14          | 33        | 17                  | 21      | 59      | 11      | 21      | 8       | 29      | 33      | 44        | 40      | 41        | 9      |
| Urban              | 96,467,686  | 2,631,877 | 299,385             | 45,429  | 109,873 | 99,285  | 102,503 | 62,595  | 74,808  | 93,768  | 633,202   | 115,424 | 989,681   | 5,924  |
| % of Total         | 64          | 57        | 61                  | 29      | 52      | 41      | 47      | 42      | 41      | 44      | 64        | 35      | 70        | 46     |
| Rural Farm         | 23,048,350  | 682,569   | 56,108              | 42,927  | 43,906  | 77,964  | 61,717  | 37,147  | 40,947  | 43,643  | 116,548   | 50,084  | 108,433   | 3,145  |
| % of Total         | 15          | 15        | 12                  | 27      | 21      | 32      | 29      | 25      | 22      | 20      | 12        | 15      | 8         | 25     |
| Rural Nonfarm      | 31,181,325  | 1,299,580 | 133,898             | 69,032  | 55,549  | 65,273  | 51,038  | 49,108  | 69,136  | 76,610  | 242,637   | 163,298 | 320,308   | 3,693  |
| % of Total         | 21          | 28        | 27                  | 44      | 27      | 27      | 24      | 33      | 37      | 36      | 24        | 50      | 22        | 29     |
| 1960 Total         | 179,325,671 | 5,426,108 | 563,748             | 193,594 | 227,649 | 277,249 | 252,430 | 155,991 | 198,665 | 224,480 | 1,168,899 | 381,384 | 1,768,117 | 13,902 |
| % Change from 1950 | 19          | 18        | 15                  | 23      | 9       | 14      | 17      | 5       | 7       | 5       | 18        | 16      | 25        | 9      |
| Urban              | 125,283,783 | 3,429,657 | 362,318             | 68,319  | 123,430 | 132,169 | 131,993 | 74,031  | 89,651  | 105,829 | 858,620   | 152,394 | 1,324,120 | 6,783  |
| % of Total         | 70          | 63        | 65                  | 35      | 54      | 48      | 52      | 48      | 45      | 47      | 73        | 40      | 75        | 49     |
| Rural Farm         | 13,444,898  | 443,320   | 36,319              | 35,732  | 32,602  | 69,455  | 47,869  | 26,615  | 28,513  | 20,054  | 68,982    | 27,164  | 47,860    | 2,155  |
| % of Total         | 7           | 8         | 6                   | 18      | 14      | 25      | 19      | 17      | 14      | 9       | 6         | 7       | 3         | 16     |
| Rural Nonfarm      | 40,596,990  | 1,553,131 | 165,111             | 89,543  | 71,617  | 75,625  | 72,568  | 55,345  | 80,501  | 98,597  | 241,297   | 201,826 | 396,137   | 4,964  |
| % of Total         | 23          | 29        | 29                  | 47      | 32      | 27      | 29      | 35      | 41      | 44      | 21        | 53      | 22        | 35     |

1/ Data for the United States for years 1940 and 1950 exclude Alaska and Hawaii.  
Source: Census of Population.



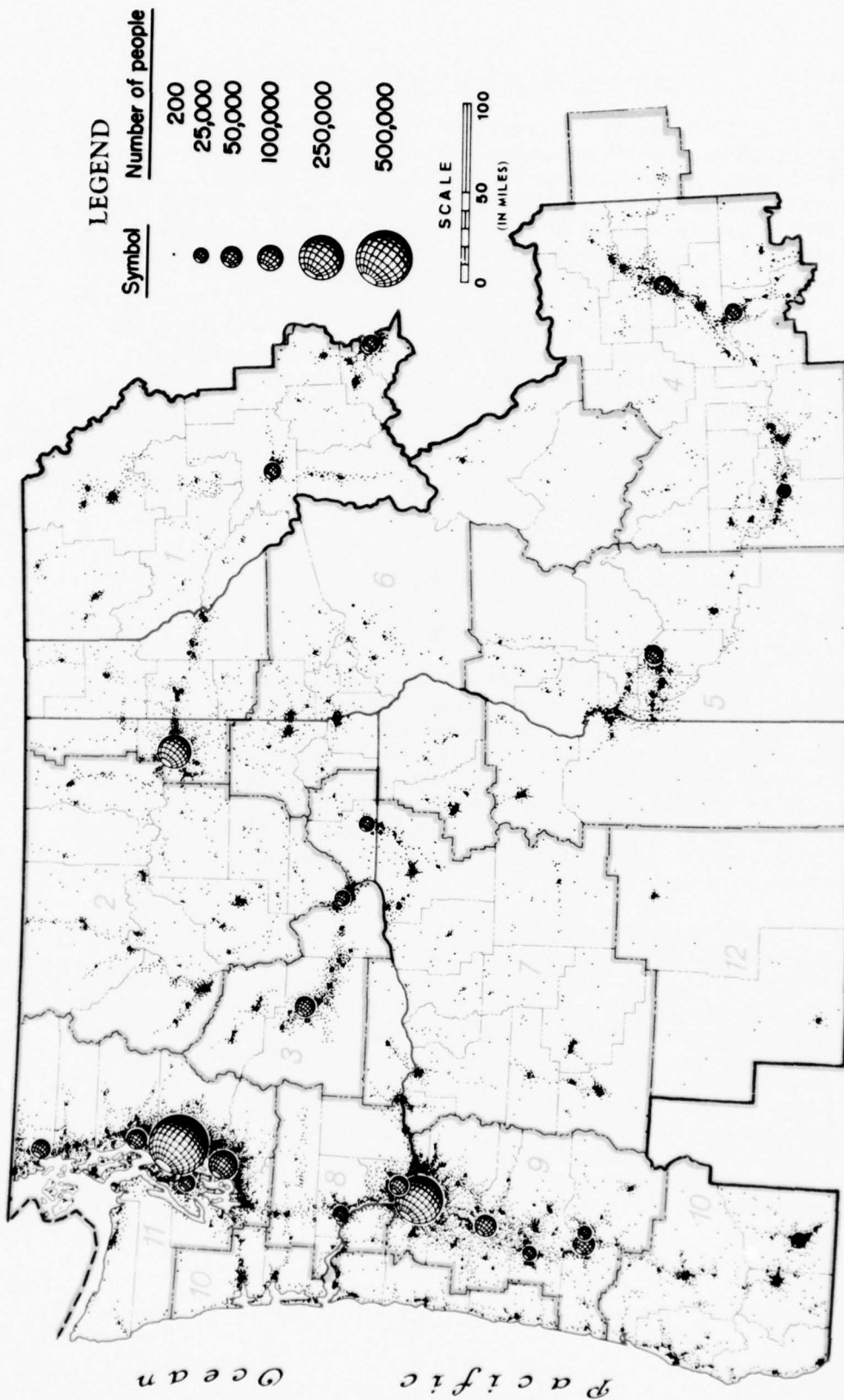


FIGURE 4

### Standard Metropolitan Statistical Areas

In 1940, about 44 percent of the population of the region lived in metropolitan areas denoted by the Bureau of the Census as Standard Metropolitan Statistical Areas (SMSA's). By 1960, the proportion of the regional population living within SMSA's had increased to nearly 50 percent. A comparison of rates of growth shows the SMSA's to be growing considerably faster than the remainder of the region.

As was reported earlier, the total region experienced a 33 percent increase in population between 1940 and 1950. Breaking this down, the SMSA's had an increase of nearly 44 percent for the same period while the increase in the remainder of the region was about 25 percent. These relative positions held through the following decade but with lower rates for the SMSA's, the remainder of the region, and for the region in total. Detailed statistics are presented in table 4.

### ECONOMY

#### Employment

There were 1.98 million persons employed in the region in 1960. This compares with 1.73 million in 1950 and 1.19 million in 1940. The level of employment was quite stable, amounting to slightly over one-third of the population in each instance. The regional employment level followed a pattern very close to that of the nation during this period. Figure 5 compares employment growth rates of the region and nation. The stability exhibited in the general level of employment has not been present in some industries.

Manufacturing within the region has shown a large increase in employment from about 230,000 in 1940 to about 447,000 in 1960. Retail trade has increased from 184,000 in 1940 to 309,000 in 1960. Professional services have more than doubled during this period. Agriculture, on the other hand, has decreased from about 221,000 in 1940 to 156,000 in 1960 with the bulk of the decrease taking place between 1950 and 1960. The decrease in agricultural employment has been caused in part by increased mechanization and improved farming methods resulting in less demand for farm labor. Figure 6 illustrates employment trends for some selected major industries. Tables 5, 6, and 7 present detailed employment statistics by subregion.

Table 4 - Population of Standard Metropolitan Statistical Areas in the  
Columbia-North Pacific Region, 1940, 1950, and 1960

| Area                                      | Population |                       |           |                       |           |
|---|------------|-----------------------|-----------|-----------------------|-----------|
|   | 1940       | % Change<br>From 1940 | 1950      | % Change<br>From 1950 | 1960      |
| Total Columbia-N. Pacific                 | 3,462,344  | 33.3                  | 4,614,026 | 17.6                  | 5,426,108 |
| Columbia-N. Pacific (excluding<br>SMSA's) | 1,951,506  | 25.1                  | 2,441,412 | 12.0                  | 2,734,185 |
| SMSA's 1/                                 |            |                       |           |                       |           |
| Eugene 2/                                 | 69,096     | 82.1                  | 125,776   | 29.5                  | 162,890   |
| Portland                                  | 501,275    | 40.6                  | 704,829   | 16.6                  | 821,897   |
| Seattle                                   | 593,734    | 42.2                  | 844,572   | 31.1                  | 1,107,213 |
| Spokane                                   | 182,081    | 51.5                  | 275,876   | 16.6                  | 321,590   |
| Tacoma                                    | 164,652    | 34.6                  | 221,561   | 25.6                  | 278,333   |
| Subtotal (SMSA's)                         | 1,510,838  | 43.8                  | 2,172,614 | 23.9                  | 2,691,923 |
| % of Total C-NP                           | 43.6       | --                    | 47.1      | --                    | 49.6      |

<sup>1/</sup> SMSA boundaries for 1940 were adjusted to correspond with the county boundaries delineating the 1950 and 1960 SMSA's.

<sup>2/</sup> Eugene was not classified as an SMSA in 1940 but the area figures are included here for comparison.

Source: Census of Population.

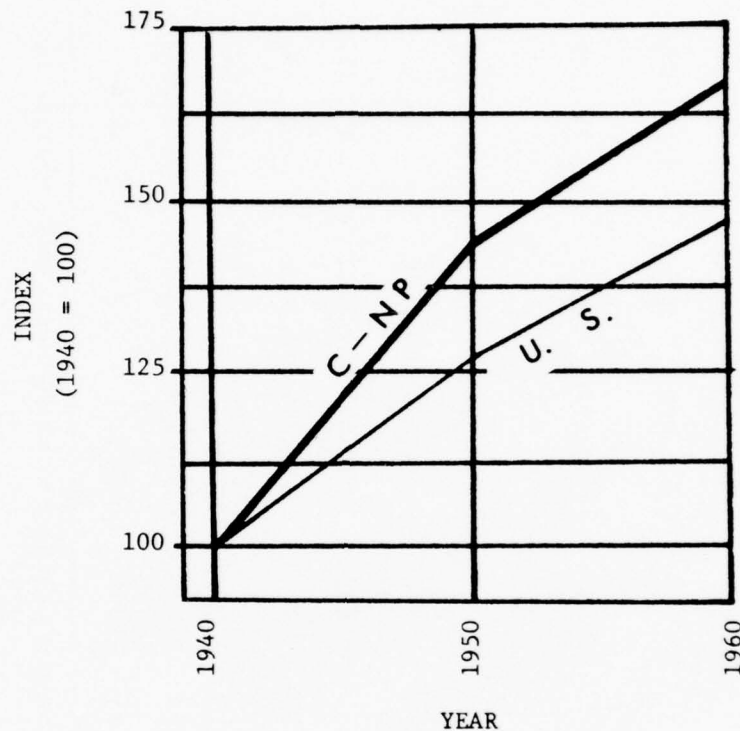


FIGURE 5. Employment Growth, United States and Columbia-North Pacific Region.

#### Personal Income and Earnings

In 1962, the major sources of income in the region were wages and salaries (65 percent), proprietors (13 percent), property (13 percent), transfer payments (six percent), and other (three percent). Manufacturing is the major source of income in the form of wages and salaries, with government, services, and trade also important. Total personal income in the region increased from \$4.6 billion in 1940, to \$13 billion in 1962, as measured in constant 1958 dollars. This amounted to an increase of 180 percent over the period compared with a national increase of 144 percent, the difference being due largely to more rapid population growth.

Per capita income in the region has compared favorably with the national average. Regional per capita income exceeded the national level each of the census years 1940,

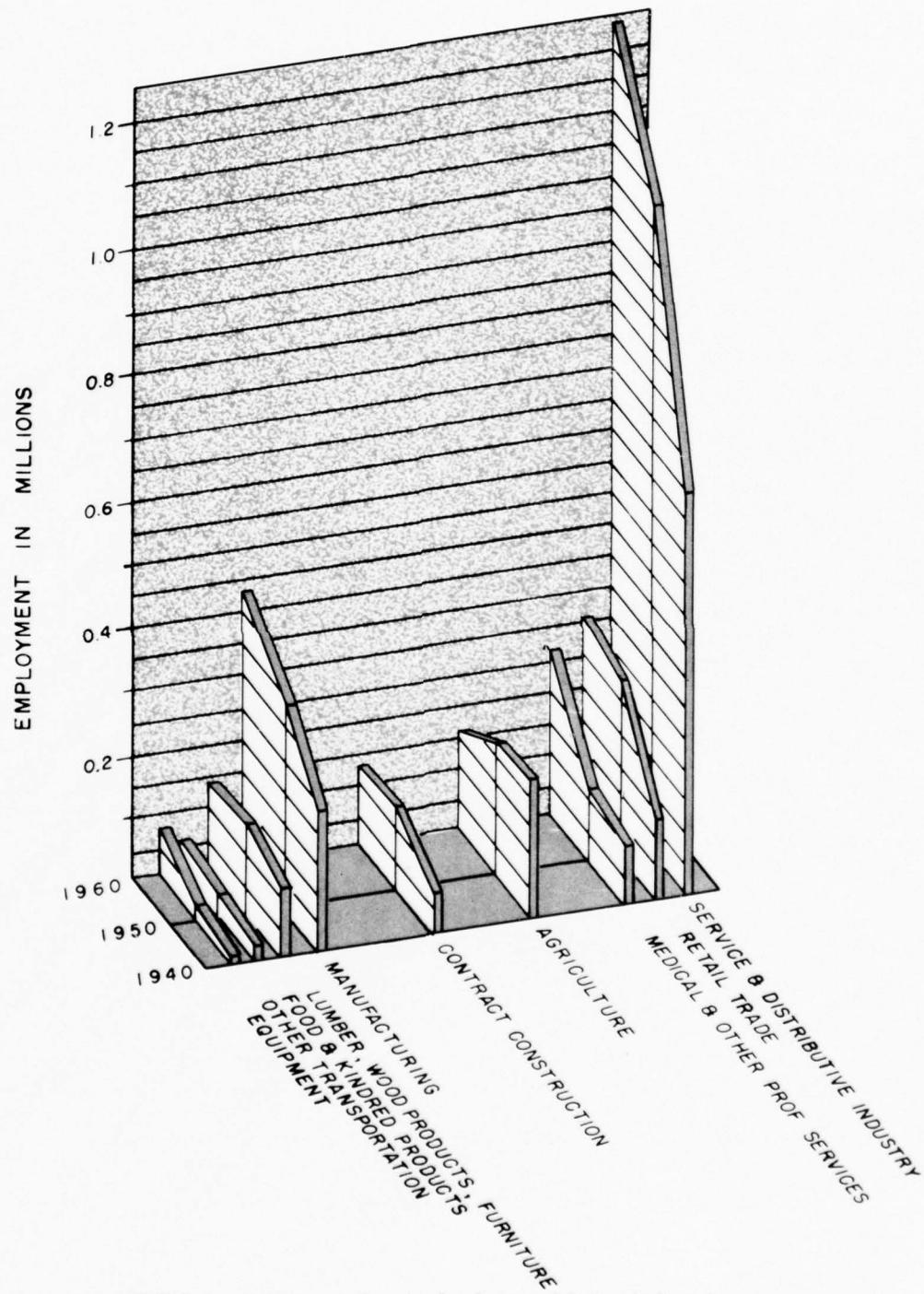


FIGURE 6. Employment Trends for Selected Major Industries, Columbia-North Pacific Region.



Table 5 - Employment by Selected Industries, Columbia-North Pacific Region and Subregions, 1940 <sup>1/</sup>

| Industry                          | Columbia<br>North Pacific | E M P L O Y M E N T |        |        |        |        |        |        |        |         |        |         |       |
|-----------------------------------|---------------------------|---------------------|--------|--------|--------|--------|--------|--------|--------|---------|--------|---------|-------|
|                                   |                           | 1                   | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9       | 10     | 11      | 12    |
| Agriculture                       | 220,872                   | 19,465              | 16,311 | 15,992 | 28,853 | 21,395 | 16,275 | 17,263 | 9,142  | 33,809  | 13,242 | 27,507  | 1,618 |
| Forestry & Fishery                | 8,326                     | 900                 | 201    | 136    | 136    | 200    | 259    | 206    | 627    | 636     | 1,590  | 3,481   | 30    |
| Mining                            | 24,044                    | 13,629              | 1,198  | 1,125  | 510    | 1,505  | 1,106  | 486    | 161    | 583     | 1,260  | 2,460   | 21    |
| Construction                      | 67,915                    | 6,837               | 6,246  | 2,304  | 2,715  | 3,266  | 2,145  | 3,031  | 2,910  | 13,556  | 3,993  | 20,690  | 222   |
| Manufacturing                     | 229,995                   | 19,770              | 3,240  | 3,063  | 2,774  | 4,287  | 4,562  | 7,461  | 19,370 | 50,626  | 26,444 | 87,248  | 1,150 |
| Food & Kindred Products           | 30,380                    | 3,232               | 407    | 1,226  | 1,548  | 1,125  | 512    | 1,272  | 815    | 7,116   | 2,447  | 10,647  | 33    |
| Textile Mill Products             | 3,193                     | 33                  | 5      | 7      | 16     | 10     | 10     | 62     | 281    | 2,363   | 21     | 385     | 0     |
| Apparel                           | 3,896                     | 149                 | 15     | 17     | 20     | 22     | 8      | 15     | 45     | 1,490   | 22     | 2,092   | 1     |
| Lumber, Wood Products & Furniture | 115,291                   | 9,025               | 2,004  | 1,041  | 262    | 1,565  | 3,444  | 5,338  | 13,117 | 22,667  | 21,695 | 34,050  | 1,083 |
| Paper & Allied Products           | 14,961                    | 1,844               | 277    | 338    | 463    | 680    | 359    | 431    | 403    | 4,129   | 677    | 5,337   | 23    |
| Printing & Publishing             | 2,822                     | 175                 | 53     | 70     | 33     | 21     | 7      | 23     | 24     | 791     | 38     | 1,587   | 0     |
| Chemicals & Allied Products       | 0                         | 0                   | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0       | 0      | 0       | 0     |
| Petroleum                         | 0                         | 0                   | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0       | 0      | 0       | 0     |
| Primary Metals                    | 5,946                     | 624                 | 84     | 103    | 111    | 199    | 70     | 136    | 99     | 1,998   | 196    | 2,315   | 6     |
| Fabricated Metals                 | 1,337                     | 111                 | 2      | 7      | 16     | 16     | 5      | 15     | 3      | 465     | 7      | 690     | 0     |
| Machinery, Excl. Electrical       | 15,055                    | 70                  | 11     | 11     | 238    | 196    | 2      | 4      | 46     | 380     | 158    | 14,475  | 0     |
| Electrical Machinery              | 37,114                    | 4,507               | 382    | 238    | 303    | 453    | 145    | 165    | 4,537  | 9,227   | 1,183  | 15,970  | 4     |
| Motor Vehicles & Equipment        | 33,474                    | 6,741               | 1,423  | 824    | 2,696  | 1,382  | 1,383  | 1,785  | 1,205  | 7,249   | 912    | 7,819   | 55    |
| Transportation Equipment          | 15,578                    | 1,640               | 481    | 642    | 926    | 707    | 486    | 597    | 594    | 3,681   | 957    | 4,829   | 38    |
| Other Manufacturing               | 20,899                    | 1,214               | 434    | 387    | 278    | 251    | 272    | 409    | 683    | 4,067   | 1,399  | 10,496  | 9     |
| Railroads & Railway Express       | 11,282                    | 1,295               | 280    | 240    | 474    | 510    | 333    | 417    | 291    | 2,578   | 511    | 4,330   | 23    |
| Trucking & Warehousing            | 15,993                    | 2,211               | 503    | 440    | 634    | 763    | 479    | 562    | 590    | 3,640   | 1,086  | 5,059   | 26    |
| Other Transportation              | 41,133                    | 4,140               | 963    | 2,046  | 3,125  | 1,686  | 961    | 1,225  | 727    | 10,475  | 1,459  | 14,285  | 41    |
| Communications                    | 183,839                   | 22,653              | 5,075  | 5,673  | 8,333  | 8,146  | 5,640  | 6,721  | 6,256  | 43,152  | 11,210 | 60,522  | 438   |
| Utilities & Sanitary Service      | 34,454                    | 4,633               | 1,171  | 920    | 1,375  | 1,298  | 992    | 1,276  | 1,231  | 7,570   | 2,263  | 11,637  | 88    |
| Wholesale Trade                   | 149,385                   | 18,020              | 3,904  | 4,753  | 6,958  | 6,848  | 4,648  | 5,465  | 5,025  | 35,582  | 8,947  | 48,885  | 370   |
| Retail Trade                      | 37,085                    | 4,366               | 615    | 847    | 1,052  | 1,169  | 736    | 826    | 829    | 9,835   | 1,343  | 15,215  | 52    |
| Eating & Drinking                 | 49,175                    | 6,461               | 1,570  | 1,279  | 2,477  | 2,216  | 1,638  | 1,948  | 1,521  | 11,031  | 3,438  | 15,395  | 201   |
| Finance, Insurance & Real Estate  | 27,596                    | 3,170               | 884    | 930    | 1,426  | 1,289  | 1,027  | 1,141  | 970    | 6,494   | 1,618  | 8,553   | 94    |
| Hotels, Lodgings                  | 11,422                    | 1,408               | 405    | 406    | 631    | 559    | 388    | 472    | 348    | 2,508   | 672    | 3,596   | 29    |
| Business & Repair Services        | 95,159                    | 11,565              | 2,751  | 2,757  | 4,569  | 4,172  | 4,411  | 4,007  | 3,245  | 22,564  | 5,208  | 29,665  | 245   |
| Entertainment & Recreation        | 38,166                    | 3,967               | 1,131  | 1,259  | 1,393  | 1,611  | 1,398  | 1,863  | 1,392  | 9,223   | 2,382  | 12,443  | 104   |
| Medical, Professional Services    | 44,271                    | 5,197               | 1,533  | 1,254  | 1,891  | 2,482  | 1,512  | 1,630  | 1,221  | 10,529  | 2,078  | 16,772  | 172   |
| Private Households                | 15,873                    | 2,563               | 0      | 0      | 0      | 101    | 0      | 0      | 0      | 1,612   | 16     | 10,534  | 0     |
| Public Administration             | 1,192,097                 | 139,392             | 45,244 | 41,528 | 64,893 | 57,697 | 45,011 | 52,050 | 53,694 | 247,252 | 81,849 | 358,899 | 4,588 |
| Armed Forces                      |                           |                     |        |        |        |        |        |        |        |         |        |         |       |
| Total                             |                           |                     |        |        |        |        |        |        |        |         |        |         |       |

<sup>1/</sup> Estimated from OBE data and Census of Population.

<sup>2/</sup> 1940 industry detail is not available for paper and allied products, petroleum, primary metals and fabricated metals, but is included in this classification.

<sup>3/</sup> Electrical and non-electrical machinery are combined into a single category for 1940.

Table 6 - Employment by Selected Industries, Columbia-North Pacific Region and Subregions, 1950 1/

| Industry                          | Columbia<br>North Pacific | E M P L O Y M E N T<br>SUBREGIONS |        |        |        |        |        |        |        |         |         |         |       |
|-----------------------------------|---------------------------|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|-------|
|                                   |                           | 1                                 | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9       | 10      | 11      | 12    |
| Agriculture                       | 210,478                   | 17,290                            | 15,011 | 17,662 | 26,666 | 22,281 | 13,702 | 15,620 | 8,482  | 34,458  | 12,285  | 25,436  | 1,651 |
| Forestry & Fishery                | 11,876                    | 1,028                             | 213    | 77     | 197    | 262    | 317    | 382    | 628    | 1,128   | 2,485   | 5,089   | 70    |
| Mining                            | 17,694                    | 11,443                            | 842    | 726    | 381    | 611    | 524    | 243    | 201    | 841     | 420     | 1,443   | 19    |
| Construction                      | 132,391                   | 12,113                            | 9,671  | 8,481  | 6,472  | 6,665  | 3,460  | 7,119  | 5,016  | 28,916  | 7,590   | 36,655  | 233   |
| Manufacturing                     | 338,905                   | 27,724                            | 4,604  | 11,306 | 4,205  | 6,394  | 7,419  | 11,100 | 26,580 | 79,944  | 44,256  | 114,145 | 1,228 |
| Food & Kindred Products           | 40,621                    | 4,033                             | 595    | 2,110  | 2,184  | 1,927  | 708    | 1,863  | 1,259  | 8,932   | 3,631   | 13,352  | 27    |
| Textile Mill Products             | 4,108                     | 48                                | 11     | 12     | 9      | 19     | 10     | 108    | 666    | 2,759   | 28      | 437     | 1     |
| Apparel                           | 4,746                     | 82                                | 9      | 25     | 23     | 23     | 9      | 15     | 195    | 1,989   | 19      | 2,357   | 0     |
| Lumber, Wood Products & Furniture | 153,180                   | 9,461                             | 2,526  | 1,095  | 330    | 2,279  | 5,844  | 7,823  | 14,892 | 38,088  | 37,088  | 32,616  | 1,138 |
| Paper & Allied Products           | 18,858                    | 391                               | 34     | 42     | 0      | 28     | 80     | 54     | 5,912  | 4,344   | 1,042   | 6,931   | 0     |
| Printing & Publishing             | 20,915                    | 2,187                             | 466    | 656    | 657    | 791    | 446    | 592    | 718    | 6,098   | 969     | 7,303   | 32    |
| Chemicals & Allied Products       | 11,210                    | 256                               | 129    | 6,461  | 298    | 97     | 28     | 78     | 129    | 1,429   | 87      | 2,217   | 1     |
| Petroleum                         | 1,728                     | 330                               | 0      | 0      | 75     | 34     | 0      | 0      | 79     | 487     | 0       | 723     | 0     |
| Primary Metals                    | 18,169                    | 7,865                             | 90     | 54     | 25     | 106    | 13     | 24     | 1,539  | 3,312   | 101     | 5,040   | 0     |
| Fabricated Metals                 | 8,951                     | 421                               | 35     | 65     | 59     | 168    | 27     | 114    | 1,673  | 3,354   | 128     | 4,413   | 0     |
| Machinery, Excl. Electrical       | 9,344                     | 644                               | 151    | 399    | 173    | 302    | 77     | 142    | 255    | 3,398   | 303     | 3,488   | 12    |
| Electrical Machinery              | 2,168                     | 176                               | 29     | 17     | 15     | 18     | 13     | 15     | 67     | 799     | 102     | 915     | 2     |
| Motor Vehicles & Equipment        | 2,110                     | 321                               | 3      | 16     | 17     | 8      | 7      | 2      | 16     | 559     | 26      | 1,135   | 0     |
| Transportation Equipment          | 29,311                    | 106                               | 21     | 17     | 4      | 11     | 9      | 54     | 72     | 590     | 218     | 28,209  | 0     |
| Other Manufacturing               | 13,486                    | 1,403                             | 505    | 337    | 336    | 583    | 148    | 216    | 614    | 3,806   | 514     | 5,009   | 15    |
| Railroads & Railway Express       | 46,969                    | 9,620                             | 2,002  | 1,097  | 3,743  | 2,091  | 1,781  | 2,313  | 1,793  | 11,116  | 1,087   | 10,263  | 63    |
| Trucking & Warehousing            | 23,938                    | 2,243                             | 1,011  | 1,927  | 2,357  | 1,066  | 594    | 990    | 550    | 5,938   | 1,078   | 6,135   | 49    |
| Other Transportation              | 32,286                    | 1,880                             | 425    | 475    | 777    | 701    | 337    | 718    | 1,242  | 7,017   | 2,170   | 16,524  | 20    |
| Communications                    | 23,713                    | 2,293                             | 621    | 630    | 1,131  | 1,232  | 603    | 861    | 935    | 5,935   | 1,221   | 8,221   | 30    |
| Utilities & Sanitary Service      | 26,460                    | 2,778                             | 1,179  | 1,179  | 1,374  | 1,674  | 507    | 993    | 1,371  | 6,417   | 1,987   | 6,957   | 44    |
| Wholesale Trade                   | 65,243                    | 6,488                             | 1,355  | 2,269  | 3,884  | 2,899  | 1,206  | 1,932  | 1,441  | 18,978  | 2,838   | 21,867  | 85    |
| Retail Trade                      | 279,458                   | 31,166                            | 7,993  | 10,366 | 13,563 | 12,692 | 7,745  | 10,464 | 10,458 | 66,333  | 18,603  | 89,437  | 638   |
| Eating & Drinking                 | 60,826                    | 7,445                             | 1,988  | 2,115  | 2,676  | 2,623  | 1,867  | 2,521  | 2,292  | 13,804  | 4,540   | 18,805  | 150   |
| Other Retail                      | 218,632                   | 23,721                            | 6,005  | 8,251  | 10,887 | 10,069 | 5,878  | 7,943  | 8,166  | 52,529  | 14,063  | 70,632  | 488   |
| Finance, Insurance & Real Estate  | 58,132                    | 5,906                             | 1,068  | 1,542  | 1,756  | 2,337  | 1,103  | 1,346  | 1,477  | 15,837  | 2,595   | 23,080  | 85    |
| Hotels, Lodgings                  | 59,540                    | 7,178                             | 1,906  | 1,987  | 3,277  | 2,438  | 1,897  | 2,464  | 1,916  | 13,146  | 4,448   | 18,705  | 178   |
| Business & Repair Services        | 45,943                    | 4,891                             | 1,431  | 1,599  | 2,439  | 2,357  | 1,547  | 2,044  | 1,755  | 11,147  | 3,117   | 13,423  | 192   |
| Entertainment & Recreation        | 16,090                    | 1,386                             | 459    | 597    | 804    | 751    | 398    | 600    | 534    | 4,081   | 928     | 5,308   | 43    |
| Medical, Professional Services    | 162,247                   | 17,764                            | 4,069  | 5,875  | 6,677  | 6,625  | 7,681  | 6,267  | 6,277  | 40,018  | 8,837   | 51,811  | 346   |
| Private Households                | 33,874                    | 3,127                             | 986    | 1,255  | 1,494  | 1,558  | 1,108  | 1,389  | 1,327  | 8,908   | 2,074   | 10,534  | 114   |
| Public Administration             | 81,106                    | 7,259                             | 2,722  | 2,365  | 2,953  | 3,746  | 1,719  | 2,856  | 2,557  | 17,294  | 3,913   | 33,534  | 188   |
| Armed Forces                      | 61,029                    | 3,830                             | 1,546  | 117    | 188    | 149    | 111    | 94     | 252    | 912     | 2,080   | 51,748  | 2     |
| Total                             | 1,727,372                 | 177,607                           | 59,114 | 71,532 | 84,273 | 78,529 | 53,759 | 69,795 | 74,793 | 378,365 | 124,012 | 550,315 | 5,278 |

1/ Estimated from OBE data and Census of Population.

Table 7 - Employment by Selected Industries, Columbia-North Pacific Region and Subregions, 1960 <sup>1/</sup>

| Industry                          | Columbia<br>North Pacific | E M P L O Y M E N T |        |        |        |        |        |        |        |         |         |         |       |
|-----------------------------------|---------------------------|---------------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|-------|
|                                   |                           | 1                   | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9       | 10      | 11      | 12    |
| Agriculture                       | 155,767                   | 10,504              | 14,411 | 15,461 | 21,910 | 17,861 | 10,229 | 11,753 | 4,876  | 21,714  | 8,117   | 17,824  | 1,107 |
| Forestry & Fishery                | 11,672                    | 1,549               | 302    | 93     | 308    | 511    | 521    | 712    | 614    | 1,622   | 2,119   | 3,149   | 172   |
| Mining                            | 11,418                    | 8,346               | 289    | 150    | 174    | 193    | 251    | 187    | 75     | 525     | 467     | 681     | 80    |
| Construction                      | 129,460                   | 11,621              | 6,978  | 6,210  | 6,726  | 7,597  | 3,048  | 5,669  | 4,929  | 28,264  | 7,230   | 40,891  | 297   |
| Manufacturing                     | 447,025                   | 32,764              | 8,255  | 15,053 | 10,169 | 11,565 | 9,311  | 12,678 | 28,111 | 97,333  | 45,184  | 175,244 | 1,358 |
| Food & Kindred Products           | 58,903                    | 4,539               | 1,022  | 3,329  | 4,773  | 5,287  | 1,040  | 2,741  | 2,264  | 12,884  | 3,973   | 16,994  | 57    |
| Textile Mill Products             | 3,944                     | 32                  | 8      | 23     | 36     | 16     | 9      | 120    | 830    | 2,386   | 12      | 472     | 0     |
| Apparel                           | 7,347                     | 104                 | 0      | 335    | 73     | 58     | 20     | 30     | 423    | 2,997   | 20      | 3,287   | 0     |
| Lumber, Wood Products & Furniture | 143,012                   | 11,494              | 3,325  | 1,257  | 355    | 2,539  | 6,095  | 6,926  | 11,927 | 36,796  | 35,891  | 27,198  | 1,209 |
| Paper & Allied Products           | 26,171                    | 616                 | 193    | 382    | 101    | 51     | 979    | 433    | 7,280  | 5,310   | 1,472   | 9,348   | 6     |
| Printing & Publishing             | 27,320                    | 2,602               | 767    | 900    | 885    | 1,006  | 510    | 774    | 1,045  | 7,013   | 1,357   | 10,417  | 44    |
| Chemicals & Allied Products       | 16,334                    | 612                 | 481    | 7,529  | 2,426  | 205    | 92     | 93     | 209    | 1,746   | 53      | 2,888   | 0     |
| Petroleum                         | 2,824                     | 324                 | 0      | 0      | 23     | 5      | 0      | 0      | 93     | 424     | 27      | 1,928   | 0     |
| Primary Metals                    | 19,942                    | 7,709               | 743    | 34     | 44     | 80     | 16     | 505    | 1,630  | 4,634   | 214     | 4,328   | 5     |
| Fabricated Metals                 | 14,487                    | 651                 | 97     | 202    | 171    | 296    | 56     | 217    | 304    | 4,570   | 138     | 7,785   | 0     |
| Machinery, Excl. Electrical       | 16,029                    | 1,057               | 243    | 283    | 428    | 410    | 159    | 679    | 5,873  | 709     | 5,968   | 29      | 29    |
| Electrical Machinery              | 9,354                     | 729                 | 139    | 90     | 39     | 94     | 20     | 58     | 196    | 4,770   | 82      | 3,133   | 4     |
| Motor Vehicles & Equipment        | 4,223                     | 323                 | 8      | 44     | 36     | 114    | 8      | 73     | 47     | 1,234   | 30      | 2,306   | 0     |
| Transportation Equipment          | 77,267                    | 565                 | 721    | 107    | 37     | 532    | 25     | 134    | 309    | 3,498   | 883     | 8,176   | 4     |
| Other Manufacturing               | 19,868                    | 1,407               | 508    | 538    | 742    | 872    | 282    | 383    | 875    | 5,198   | 756     | 7,862   | 31    |
| Railroads & Railway Express       | 35,786                    | 6,909               | 1,313  | 771    | 3,117  | 1,558  | 1,207  | 1,936  | 1,522  | 8,804   | 1,807   | 8,138   | 59    |
| Trucking & Warehousing            | 29,610                    | 2,521               | 1,042  | 1,875  | 2,646  | 1,279  | 711    | 843    | 906    | 7,783   | 2,372   | 16,910  | 12    |
| Other Transportation              | 32,758                    | 1,526               | 509    | 519    | 685    | 831    | 238    | 671    | 1,532  | 6,953   | 2,430   | 9,579   | 74    |
| Communications                    | 26,460                    | 2,809               | 807    | 726    | 1,111  | 1,160  | 512    | 881    | 754    | 6,617   | 1,430   | 7,668   | 51    |
| Utilities & Sanitary Service      | 28,957                    | 2,900               | 1,972  | 1,340  | 1,710  | 1,924  | 447    | 995    | 1,119  | 6,890   | 1,941   | 7,668   | 85    |
| Hotels, Lodgings                  | 82,813                    | 8,189               | 2,808  | 3,626  | 4,721  | 3,747  | 1,511  | 2,352  | 1,615  | 22,815  | 3,280   | 28,054  | 680   |
| Wholesale Trade                   | 309,366                   | 33,229              | 9,883  | 11,680 | 16,131 | 14,930 | 8,790  | 11,945 | 10,780 | 70,921  | 20,264  | 100,133 | 179   |
| Retail Trade                      | 63,498                    | 6,933               | 2,085  | 2,110  | 3,446  | 2,949  | 2,035  | 2,598  | 2,217  | 14,384  | 4,668   | 19,894  | 501   |
| Eating & Drinking                 | 245,868                   | 26,296              | 7,798  | 9,570  | 12,685 | 11,981 | 6,755  | 9,347  | 8,563  | 56,537  | 15,596  | 80,239  | 501   |
| Other Retail                      | 79,937                    | 7,706               | 1,798  | 2,108  | 2,941  | 3,391  | 1,343  | 1,873  | 1,921  | 21,154  | 3,623   | 31,948  | 111   |
| Finance, Insurance & Real Estate  | 59,986                    | 7,148               | 1,903  | 2,153  | 3,160  | 3,160  | 1,702  | 2,417  | 1,886  | 13,162  | 4,596   | 18,313  | 167   |
| Business & Repair Services        | 49,185                    | 4,671               | 1,248  | 1,493  | 3,790  | 2,416  | 875    | 1,531  | 1,553  | 12,971  | 2,722   | 15,811  | 104   |
| Entertainment & Recreation        | 14,982                    | 461                 | 504    | 773    | 646    | 401    | 441    | 424    | 424    | 3,215   | 881     | 5,467   | 41    |
| Medical, Professional Services    | 259,688                   | 27,029              | 7,485  | 9,231  | 10,596 | 10,154 | 10,509 | 9,706  | 9,611  | 64,341  | 14,821  | 85,675  | 530   |
| Private Households                | 52,527                    | 5,489               | 2,150  | 2,330  | 2,350  | 2,665  | 1,776  | 2,569  | 2,180  | 11,219  | 3,295   | 16,338  | 166   |
| Public Administration             | 98,861                    | 9,800               | 3,403  | 3,015  | 4,279  | 5,016  | 1,962  | 3,678  | 3,166  | 22,581  | 5,040   | 36,671  | 250   |
| Armed Forces                      | 62,498                    | 7,429               | 3,529  | 1,158  | 434    | 3,746  | 256    | 217    | 162    | 2,210   | 1,835   | 41,369  | 153   |
| Total                             | 1,978,756                 | 193,867             | 70,546 | 79,496 | 97,960 | 94,350 | 55,600 | 73,054 | 77,736 | 431,094 | 131,780 | 667,745 | 5,528 |

<sup>1/</sup> Estimated from OBE data and Census of Population.

1950, and 1960. However, since 1950 the rate of increase in per capita income for the region has been lower than for the nation. Although the regional per capita income has been relatively high, there has been considerable disparity among the subregions.

In 1940, Subregion 4, the Upper Snake River Area, had a per capita income of only \$906 while that of the Puget Sound Area, Subregion 11, was some 72 percent higher at \$1,574. These same subregions also represented the two extremes in 1962, but the difference between them was less. Table 8 presents statistics on personal income and per capita income for the subregions, the region, and the nation.

Table 8 - Income, Total Personal and Per Capita, Columbia-North Pacific Region, Subregions and United States 1940, 1950, and 1962.

| Area                   | Total Personal Income <sup>1/</sup> |           |           | Per Capita Income <sup>1/</sup> |       |       |
|------------------------|-------------------------------------|-----------|-----------|---------------------------------|-------|-------|
|                        |                                     |           |           |                                 |       |       |
|                        | 1940                                | 1950      | 1962      | 1940                            | 1950  | 1962  |
|                        | Mil. dol.                           | Mil. dol. | Mil. dol. | Dol.                            | Dol.  | Dol.  |
| Subregion 1            | 571                                 | 881       | 1,187     | 1,369                           | 1,795 | 2,057 |
| 2                      | 160                                 | 322       | 447       | 1,227                           | 2,040 | 2,271 |
| 3                      | 160                                 | 389       | 519       | 1,213                           | 1,851 | 2,230 |
| 4                      | 189                                 | 358       | 542       | 906                             | 1,531 | 1,938 |
| 5                      | 195                                 | 346       | 544       | 1,102                           | 1,602 | 2,080 |
| 6                      | 137                                 | 271       | 326       | 1,002                           | 1,816 | 2,032 |
| 7                      | 182                                 | 371       | 453       | 1,275                           | 1,996 | 2,237 |
| 8                      | 192                                 | 397       | 502       | 1,192                           | 1,850 | 2,165 |
| 9                      | 976                                 | 1,945     | 2,835     | 1,417                           | 1,946 | 2,328 |
| 10                     | 279                                 | 630       | 770       | 1,188                           | 1,905 | 2,034 |
| 11                     | 1,589                               | 2,979     | 4,826     | 1,574                           | 2,093 | 2,633 |
| 12                     | 18                                  | 32        | 32        | 1,570                           | 2,479 | 2,459 |
| Columbia North-Pacific | 4,649                               | 8,922     | 12,982    | 1,348                           | 1,929 | 2,325 |
| United States          | 172,235                             | 274,097   | 419,629   | 1,300                           | 1,805 | 2,258 |

<sup>1/</sup> In 1958 dollars.  
Source: OBE, March 1968.



УЗОНОМ ИТИ & КУШУТИ

## FORESTRY IN THE REGION'S ECONOMY

### INTRODUCTION

Forest products manufactured in the Columbia-North Pacific Region contribute significantly to the Nation's timber economy. Increasing national and world demand for wood assures that the region's production will be limited only by the economically available supply of timber. The future levels of timber harvest, which would be required by the projected industrial development, are based on the assumption that forest landowners, both public and private, would continue to increase their investments in forestry. Projected industrial wood consumption based on this timber harvest will be realized only if present trends in forest land loss continue in the future and if logging and industrial technology are further developed. The volume of sawtimber inventory will continue to decline as young trees replace old-growth timber, while concurrently there will be an increase in forest growth rates. Changing national demand will alter the forest product mix; the paper and allied products industry will become the dominant consumer of wood fiber by the year 2020.

National and regional projections of the demand for wood products and the available supply of forest resources were developed from several studies (22) (64) (66) (78).

The following statistical data and most of the narrative were developed from Wall's 1969 report (78). Additional detail, including state breakdown of subregional information, is presented in this publication.

### THE TIMBER RESOURCE

Forests cover 85.8 million acres or nearly 50 percent of the total land area in the Columbia-North Pacific Region. Of this area, 70.4 million acres are classed as commercial forest land, supporting over 1 trillion board feet of standing timber. This amounts to 14 percent of the Nation's commercial forest area and 41 percent of its sawtimber volume.

Of the 15.4 million acres classed as noncommercial forest land, 5.1 million acres are of commercial character but are in areas reserved for use as National Parks; wild, wilderness and primitive areas; and other Federal, state, county, and municipal reserves. The remaining 10.3 million acres of non-commercial forest lands are unsuitable for growing commercial timber crops because of their low productivity or other factors.

The principal commercial species are the conifers, Douglas-fir, the pines, true firs, hemlock, spruce, cedar and larch. The principal hardwoods of commercial value are the cottonwood, alder, maple and oak.

The National Forests make up the largest forest land ownership in the region, with 51 percent (36 million acres) of commercial area. Private ownerships are next, with 34 percent (24 million acres). State ownerships account for six percent (4 million acres), public domain and O&C with four percent (2.9 million acres), and Indian lands with three percent (2.4 million acres). Miscellaneous other public ownerships account for the remaining one percent. The detail of this ownership is presented in the Forest Land Section of Appendix IV, Land and Mineral Resources.

The Columbia-North Pacific Region contains an estimated net sawtimber volume of 1,046 billion board feet (table 9). This is over 40 percent of the nation's total sawtimber inventory, and almost half its softwood volume. Live, sound trees account for 97 percent of this volume; the remaining three percent is in sound and salvable dead trees.

Public owners account for 71 percent of the sawtimber volume and the National Forests account for three-fourths of this (table 10). The remaining 29 percent is in private ownership with forest industries owning about two-thirds of it.

Four species groups make up 79 percent of the total sawtimber volume in the region. These are Douglas-fir (44 percent), western hemlock (14 percent), the true firs (12 percent), and ponderosa and Jeffrey pine (nine percent).

About 41 percent of the sawtimber inventory is over 29 inches in diameter at breast height. The largest sawtimber is generally concentrated in western Oregon and western Washington, although the ponderosa pine area also has substantial volumes of large timber. Over the years, the average size of the sawtimber inventory has been declining with the continued harvest

Table 9 - Area of Commercial Forest Land and Volume of Sawtimber in the Columbia-North Pacific Region and Subregions, 1966

| Subregion | Commercial Forest Land <sup>1/</sup> |         | Volume <sup>2/</sup> |         | Average Volume per Acre |
|-----------|--------------------------------------|---------|----------------------|---------|-------------------------|
|           | Thousand Acres                       | Percent | Million Bd. ft.      | Percent | Bd. ft.                 |
| 1         | 15,759                               | 22      | 115,802              | 11      | 7,359                   |
| 2         | 4,547                                | 6       | 37,266               | 3       | 7,635                   |
| 3         | 1,273                                | 2       | 29,168               | 3       | 17,731                  |
| 4         | 2,515                                | 4       | 15,684               | 2       | 7,049                   |
| 5         | 2,819                                | 4       | 34,498               | 3       | 9,382                   |
| 6         | 10,257                               | 15      | 74,557               | 7       | 8,395                   |
| 7         | 6,516                                | 9       | 61,964               | 6       | 10,488                  |
| 8         | 2,474                                | 4       | 96,571               | 9       | 27,319                  |
| 9         | 4,961                                | 7       | 168,542              | 16      | 28,591                  |
| 10        | 12,834                               | 18      | 260,365              | 25      | 25,493                  |
| 11        | 5,004                                | 7       | 134,589              | 13      | 22,169                  |
| 12        | 1,409                                | 2       | 16,709               | 2       | 10,575                  |
| C-NP      | 70,368                               | 100     | 1,045,715            | 100     | 14,886                  |

<sup>1/</sup> Pacific Northwest and Intermountain Forest and Range Experiment Station county data adjusted to hydrologic subregions.

<sup>2/</sup> International 1/4 inch Rule.

Table 10 - Sawtimber Volume by Ownership Class, Columbia-North Pacific Region, 1966

| Ownership Class   | Sawtimber Volume (Million board feet) <sup>1/</sup> | Percent |
|-------------------|---|---------|
| National Forest   | 565,823   | 54      |
| Other Public      | 176,868   | 17      |
| Total Public      | 742,691   | 71      |
| Private           | 303,024   | 29      |
| Total, All Owners | 1,045,715   | 100     |

<sup>1/</sup> International 1/4 inch Rule.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.



of the old growth. New manufacturing technology in both primary and secondary manufacturing has been developing as the timber harvest of small-size trees has been increasing. This trend toward smaller log utilization will continue in the future, and will tend to reduce the present differences in tree size across the region. At the present time, a wide differential in size of trees still exists. For instance, the proportion of the number of trees under 20 inches d.b.h. ranges from 18 percent in western Oregon to 67 percent in western Montana.

In 1962, the net growth of the sawtimber in the region amounted to 11.4 billion board feet, or 20 percent of the nation's sawtimber growth (table 11). Western Washington accounted for 43 percent of the region's net annual growth, reflecting the presence of thrifty second-growth stands, good site, and favorable stocking. The net growth in other areas is lower in part due to poorer sites and due to a greater proportion of old-growth stands. In all areas forest management can increase timber yields through augmented investments in more intensive forest management practices.

Table 11 - Net Annual Growth of Growing Stock and Sawtimber on Commercial Forest Land in the Columbia-North Pacific Region, by State Area, 1962 <sup>1/</sup>

| Area               | Sawtimber                                 |                     | Growing Stock               |                     |
|--------------------|---|---------------------|-----------------------------|---------------------|
|                    | Total<br>Million<br>Bd. Ft. <sup>2/</sup> | Bd. Ft.<br>per Acre | Total<br>Million<br>Cu. Ft. | Cu. Ft.<br>per Acre |
| Western Oregon     | 2,700                                     | 196                 | 595                         | 42                  |
| Western Washington | 4,920                                     | 484                 | 1,137                       | 105                 |
| Eastern Oregon     | 955                                       | 84                  | 279                         | 25                  |
| Eastern Washington | 997                                       | 119                 | 304                         | 36                  |
| Northern Idaho     | 707                                       | 108                 | 169                         | 26                  |
| Southern Idaho     | 505                                       | 70                  | 114                         | 15                  |
| Western Montana    | 647                                       | 62                  | 160                         | 15                  |
| Total              | 11,431                                    | 158 <sup>3/</sup>   | 2,758                       | 38 <sup>3/</sup>    |

<sup>1/</sup> Includes all of Washington, Oregon, Idaho, and western Montana and is based on data in "Timber Trends in the United States".

<sup>2/</sup> International 1/4 inch Rule.

<sup>3/</sup> Weighted average.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.



## THE PRESENT FORESTRY INDUSTRY

In 1869, about 218 million board feet (International 1/4 inch Rule) of logs were harvested in the Columbia-North Pacific Region. By 1899, 2.5 billion board feet of timber were harvested. Between 1899 and 1929 the region's forest economy went through its greatest period of expansion and the timber cut supporting the industrial capacity increased about 500 percent to 15 billion board feet. During the depression the region's timber harvest declined with the drop in national demand, but during World War II production increased. In recent years, the timber harvest has continued to increase but at a slower rate. During the period 1952 through 1964, production increased from 18.4 to 21.0 billion board feet (table 12).

Table 12 - Annual Log Production, Columbia-North Pacific Region and Subregions, 1952, 1956, 1962 and 1964

| Subregion | 1952                                | 1956       | 1962       | 1964       |
|-----------|-------------------------------------|------------|------------|------------|
|           | (Thousand board feet) <sup>1/</sup> |            |            |            |
| 1         | 1,182,636                           | 1,834,549  | 1,702,565  | 1,882,016  |
| 2         | 318,126                             | 425,080    | 446,934    | 523,089    |
| 3         | 175,509                             | 171,677    | 302,800    | 381,675    |
| 4         | 20,464                              | 48,728     | 45,555     | 73,905     |
| 5         | 222,355                             | 386,724    | 402,593    | 482,790    |
| 6         | 743,706                             | 1,055,742  | 935,079    | 1,005,647  |
| 7         | 898,970                             | 1,141,542  | 955,746    | 1,001,185  |
| 8         | 1,481,105                           | 1,986,809  | 1,933,165  | 2,384,241  |
| 9         | 4,007,062                           | 3,313,927  | 3,652,629  | 3,695,742  |
| 10        | 7,026,620                           | 6,707,254  | 5,507,301  | 6,411,451  |
| 11        | 2,144,332                           | 2,298,433  | 2,169,364  | 2,784,339  |
| 12        | 156,306                             | 314,484    | 232,368    | 339,059    |
| C-NP      | 18,377,191                          | 19,684,949 | 18,286,099 | 20,965,139 |

<sup>1/</sup> International 1/4 inch Rule.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

### The Lumber Industry

Lumber is the region's major forest product. Production of lumber increased greatly up to 1929, declined during the 1930's, and then recovered by the 1940's. Since 1950, lumber

production has fluctuated between 12 and 15 billion board feet, and in 1965 nearly 15 billion board feet of lumber were produced by 925 sawmills (table 13 and table 14).

The Douglas-fir area is the leading lumber-producing zone in the region with about 8.6 billion board feet of production in 1966. Both lumber production and the number of sawmills have been declining in western Oregon and western Washington. Between 1950 and 1966 lumber production declined 14 percent, and during the 1956-64 period the number of sawmills declined 38 percent in western Oregon and 37 percent in western Washington.

The inland sawmills, east of the Cascade Range, have been increasing their total production. Their share of the region's lumber production has increased from 25 percent in 1950 to 38 percent in 1965. Eastern Washington's lumber output has been growing more rapidly than most other areas in the western United States; in 1950 eastern Washington had a lumber production of 668 million board feet and by 1965 it has increased to 1.2 billion board feet. A recent study of eastern Washington showed that the number of sawmills has been declining there despite increasing lumber production (82). In 1953 there were 296 mills and by 1963 the number had dropped to only 77. It is estimated that in 1967 there were only 66 mills remaining in eastern Washington. In general, the smallest sawmills are the ones which have disappeared.

Between 1950 and 1962 lumber production increased 26 percent in eastern Oregon, but the number of sawmills dropped from 70 to 30. In the business expansion period 1961 through 1967, the number of sawmills increased from 30 to 50 mills and lumber production has been increasing.

In Idaho and western Montana lumber production has been generally increasing since the early 1950's, but the number of sawmills has been declining. In 1956 Idaho had 311 sawmills in operation and by 1962 there were only 193 mills remaining. In all of Montana there were 333 mills operating in 1956, but only 209 remained in 1962 (87). Western Montana has had the greatest growth (up 122 percent) in lumber production in the Columbia-North Pacific Region during the 1950-1962 period, while in Idaho production increased the least (17 percent).

#### The Plywood Industry

The Columbia-North Pacific Region has been the leading plywood supplier in the nation since Douglas-fir plywood was first shown as a potential product at the Lewis and Clark

Table 13 - Total Output of Timber Products by Product,  
Columbia-North Pacific Region and Subregions, 1965

| Sub-<br>region | Lumber <sup>1/</sup> | Plywood <sup>2/</sup><br>(3/8-in.)<br>(MM) | Woodpulp <sup>3/</sup> | Particle-<br>board <sup>4/</sup><br>(3/4-in.)<br>(MM) | Misc.<br>Prod-<br>ucts <sup>5/</sup><br>(M) | Foreign<br>Log<br>Exports <sup>6/</sup><br>(M) |
|----------------|----------------------|--|------------------------|---|---|--|
|                | MBF                  | Sq. Feet                                   | Tons                   | Sq. Feet  | Cu. Ft.                                     | Cu. Ft.  |
| 1              | 2,108,261            | 532  | 315,232                | 3   | 8,430                                       | -  |
| 2              | 531,116              | -  | 16,507                 | -   | 6,740                                       | 500  |
| 3              | 260,886              | 125  | -                      | -   | 3,310                                       | -  |
| 4              | 51,020               | -  | -                      | -   | 220   | -  |
| 5              | 375,846              | 69   | -                      | -   | 2,347                                       | -  |
| 6              | 1,087,174            | 250  | 251,000                | -   | 5,211                                       | -  |
| 7              | 1,271,978            | 213  | 219,018                | 17  | 6,151                                       | -  |
| 8              | 1,279,826            | 798  | 1,649,526              | 3   | 16,889                                      | 12,250   |
| 9              | 3,165,402            | 3,873                                      | 634,462                | 132   | 19,736                                      | 7,617  |
| 10             | 3,208,567            | 3,933                                      | 709,674                | 133   | 24,062                                      | 71,000   |
| 11             | 1,435,222            | 1,278                                      | 1,595,580              | -   | 22,409                                      | 58,800   |
| 12             | 181,173              | 10   | -                      | -   | 492   | -  |
| C-NP           | 14,956,471           | 11,081                                     | 5,391,000              | 288   | 115,997                                     | 150,167  |

<sup>1/</sup> Based on 1964-65 Statistical Yearbook by Western Wood Products Association.

<sup>2/</sup> Based on 1965 APA softwood plywood data, and forest industries' hardwood plywood data.

<sup>3/</sup> Estimates of woodpulp production based on preliminary wood consumption data for the West (Bureau of Census).

<sup>4/</sup> Based on 1965 Census of Manufactures' data.

<sup>5/</sup> Pilings, poles, posts, fuelwood, ties, excelsior, shingles, bolts, etc.

<sup>6/</sup> Based on 1965 U. S. Department of Commerce data.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

Table 14 - Number and Capacity of Manufacturing Plants by Type,  
Columbia-North Pacific Region and Subregions, 1965

| Subregion | Sawmills 1/      |                   |                  | Veneer only 1/   |   |                    | Particle-<br>Board 2/3/ |  |                    | Plywood 1/ 3/    |  |                    | Woodpulp 4/      |                        |  |
|-----------|------------------|-------------------|------------------|------------------|---|--------------------|-------------------------|--|--------------------|------------------|--|--------------------|------------------|------------------------|--|
|           | No. of<br>plants | Daily<br>Capacity | No. of<br>Plants | No. of<br>Plants | Annual<br>Capacity<br>(1/8-inch<br>Basis) |                    | No. of<br>Plants        | Annual<br>Capacity<br>(3/4-in.<br>Basis) |                    | No. of<br>Plants | Annual<br>Capacity<br>(3/8-in.<br>Basis) |                    | No. of<br>Plants | Daily<br>Ca-<br>pacity |  |
|           |                  |                   |                  |                  | Bd. ft.                                   | Million<br>Sq. ft. |                         | Million<br>Sq. ft.                       | Million<br>Sq. ft. |                  | Million<br>Sq. ft.                       | Million<br>Sq. ft. |                  | Tons                   |  |
| 1         | 207              | 9,087,880         | --               | --               | --  | --                 | 1                       | 8  | 582                | 7                | 582                                      | 582                | 2                | 837                    |  |
| 2         | 48               | 2,218,500         | --               | --               | --  | --                 | --                      | --                                       | --                 | --               | --                                       | --                 | 1                | 50                     |  |
| 3         | 9                | 922,000           | 1                | --               | 9   | --                 | --                      | --                                       | 132                | 1                | 132                                      | 132                | --               | --                     |  |
| 4         | 32               | 412,630           | --               | --               | --  | --                 | --                      | --                                       | --                 | --               | --                                       | --                 | --               | --                     |  |
| 5         | 31               | 1,487,760         | --               | --               | --  | --                 | --                      | --                                       | --                 | 3/               | --                                       | --                 | --               | --                     |  |
| 6         | 67               | 4,341,090         | --               | --               | --  | --                 | --                      | --                                       | 66                 | 2 3/             | 66                                       | 66                 | --               | --                     |  |
| 7         | 42               | 4,452,000         | 2                | --               | 77  | --                 | --                      | --                                       | 248                | 2 3/             | 248                                      | 248                | 1                | 650                    |  |
| 8         | 51               | 4,870,000         | 6                | --               | 683                                       | --                 | 1                       | 33                                       | 216                | 3                | 216                                      | 216                | 3                | 730                    |  |
| 9         | 185              | 12,265,000        | 21               | --               | 3,247                                     | --                 | 1                       | 7  | 844                | 9                | 844                                      | 844                | 7                | 5,160                  |  |
| 10        | 138              | 12,393,500        | 12               | --               | 2,253                                     | --                 | 6                       | 257                                      | 3,897              | 41               | 3,897                                    | 3,897              | 11               | 2,705                  |  |
| 11        | 110              | 6,260,000         | 3                | --               | 521                                       | --                 | 5                       | 260                                      | 4,075              | 45               | 4,075                                    | 4,075              | 7                | 2,720                  |  |
| 12        | 5                | 655,000           | --               | --               | --  | --                 | --                      | --                                       | 1,416              | 20               | 1,416                                    | 1,416              | 14               | 4,833                  |  |
|           |                  |                   |                  |                  |   |                    | --                      | --                                       | 80                 | 1                | 80                                       | 80                 | --               | --                     |  |
| C-NP      | 925              | 59,365,360        | 45               | 14               | 6,795                                     | 565                | 14                      | 565                                      | 11,556             | 131              | 11,556                                   | 11,556             | 46               | 17,685                 |  |

1/ 1966 Directory of Forest Products Industry.

2/ 1967 Directory of the Forest Products Industry.

3/ Plants under construction are not included.

4/ Lockwood's Directory of Paper and Allied Trades, 1966.

Source: Wall, Brian R., Projected Developments of the Timber  
Economy of the Columbia-North Pacific Region, USDA,  
Forest Service, Pacific Northwest Forest & Range  
Experiment Station, Portland, Oregon, February 1969.



Exposition in 1905. This industry developed in the Puget Sound Subregion and was chiefly associated with door manufacturers in its early stages. New technology in making plywood aided in making better and more acceptable products, and after World War II the industry grew rapidly, especially in western Oregon.

In 1940 the region accounted for 100 percent of the softwood plywood production in the nation, and in 1965 it accounted for about 87 percent of the nation's plywood production (11 billion square feet, 3/8 inch basis) (table 13). Subregions 9 and 10 account for about two-thirds of the region's plywood capacity. In recent years, Idaho and western Montana's plywood industry has been growing relative to that in Washington and Oregon. The growth of the plywood industry in California and the southern states has reduced the region's share of national plywood production.

#### The Pulp Industry

A one year paper mill operation in 1866 at Oregon City, Oregon is recognized as the first pulp and paper enterprise in the Northwest (27). In 1868, a mill was installed on the Clackamas River and was moved to Camas, Washington in 1883. After a slow start the industry began to enlarge in the 1880's, with the Washington state industry growing most rapidly through the 1920's due to a ready supply of raw materials needed for the sulphite pulping process. As technology changed, use of a wider range of species became possible through the sulfate pulping process. Washington attracted even more pulp industry development and in 1965 this state ranked second in woodpulp production in the nation. The major pulp industry growth in Oregon, Idaho and western Montana has occurred since World War II and especially in the late 1950's and early 1960's. In 1947 the region's pulp industry produced about two million tons of pulp, and in 1965 it produced approximately 5.4 million tons, or 16 percent of the nation's woodpulp (table 13).

In 1965 the Lower Columbia and the Puget Sound Subregions together accounted for 60 percent (3.2 million tons) of the pulp production in the region. Subregions 9 and 10 are also major pulp producers, with approximately 710,000 tons and 634,000 tons of production, respectively. Subregions 1 and 6 were the largest pulp producers on the east side of the Cascades, with about 315,000 tons and 251,000 tons of production, respectively, in 1965. Due to favorable raw material and water supply factors, the subregions in eastern Washington, Idaho and western Montana offer some of the best chances for new pulpmill installations in the coming decades.



The expansion of the pulping activity in the region has been based, in part, on the availability of wood residues from other manufacturing processes. In 1950, roundwood accounted for 81 percent of the total wood fiber consumption by the region's pulpmills. By 1965, however, it was estimated that 68 percent of all the wood fiber consumed was residue from sawmills, planing mills and plywood plants. Opportunities for further expansion based on available residue supplies appear to be limited. Increased export of chips to Japan is expected to peak in the near future and finally decline prior to the year 2000. A long-term leveling off of mill residue production is expected, which will effectively place a ceiling on this raw material source for pulp.

#### The Particleboard Industry

During the 1950's the particleboard industry was established, based on available supplies of sawmill residues. For this reason, the industry located mostly in Oregon near large raw material supplies. In 1965 only about 51 percent of the installed particleboard capacity was used to produce 288 million square feet (3/4 inch) of particleboard (table 13).

#### Foreign Log Exports

The 1960's have been marked by a rapid rise in foreign demand for roundwood from the region. In 1961, 56 million cubic feet of timber were exported and by 1965 log exports had increased 2.7 times to 150 million cubic feet. Since 1965 the export of roundwood has continued to climb, reaching 171 million cubic feet in 1966 and 262 million cubic feet in 1967. Japan purchases most of this exported roundwood, although its share of the total exports has varied over time. In 1961 it took 98 percent of the total volume exported. In 1965 this decreased to 80 percent, with Canada increasing its share from two percent to 13 percent. In 1967 Japan (95 percent), Canada (three percent), and South Korea (two percent) were the major importers of the region's roundwood (28).

In 1965 the Coastal Subregion of western Oregon and western Washington ranked first in foreign log exports with a total of 71 million cubic feet. The Puget Sound Subregion exported the second largest roundwood volume to foreign countries--59 million cubic feet. These exported volumes were not necessarily harvested in these subregions.

In 1968 Congress passed a law limiting the foreign export

of logs from federal lands. The law came into being after the projections were made for this study; however, the recent developments indicate that the projections will not be significantly affected.

### Employment

There has been a long-term downward trend in total forest industry employment due, in part, to increases in productivity. But this influence which reduces employment has been somewhat offset by changes in industry mix and the increase in further manufacturing. Employment in logging, sawmills, and planing mills has been declining since 1950, and that in miscellaneous wood manufacturing has been relatively stable. Employment in plywood plants and the pulp, paper and allied products industry has been increasing over the past 15 years. In 1950, about 169,000 workers were employed by the forest industries of the region, and in 1965 the employment level was nearly three percent lower at 165,789 workers. Because of the excellent business conditions in 1965 and the intensive use of plant capacity, employment levels in that year were above the long-term average.

In 1965, the State of Oregon, exclusive of Klamath County, had the largest forest industry employment in the region (78,765), Washington was second (66,724), and Idaho was third (12,385). The Willamette Subregion had the largest forest industry employment of any subregion--39,944. The Coastal Subregion ranked second with 35,913 workers, and the Puget Sound Subregion ranked third with 31,360 workers (table 15).

Although the manufacture of lumber provides the most employment in the forest industry for the region as a whole, it leads the other major forest industries in only Idaho and western Montana. Here, employment in sawmills and planing mills (SIC<sup>1/</sup> 242) accounted for 7,719 and 4,740 employees, respectively, in 1965. In Washington the pulp, paper and allied products industry (SIC 26) was the leading employer with 19,789 workers. Sawmills and planing mills (SIC 2421) in Washington ranked second with 16,421 workers; whereas, veneer and plywood plants (SIC 2432) ranked third with 10,480 workers. In all of Oregon, including Klamath County, the veneer and plywood industry (SIC 2432) was the largest single forest industry employer with 27,629 workers in 1965; sawmills and planing mills (SIC 2421) ranked second with 25,510 employees.

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<sup>1/</sup> Standard Industrial Classification.

Table 15 - Forest Industry Employment by Industry,  
Columbia-North Pacific Region and Subregions, 1965

| Subregion | Logging<br>(SIC 241) | Sawmills &<br>Planing<br>Mills<br>(SIC 242) | Veneer, Mill-<br>work Plywood,<br>Prefabricated<br>Structures<br>(SIC 243) | (Number of persons) |         | Total<br>(SIC 24)    | Paper &<br>Allied<br>Products<br>(SIC 26) | Total<br>(All) |
|-----------|----------------------|---|--|---------------------|---------|----------------------|---|----------------|
|           |                      | All Other<br>(SIC 24)                       |  |                     |         |                      |   |                |
| 1         | 2,446                | 8,136                                       | 2,094  | 454                 | 13,130  | 750                  | 13,880                                    |                |
| 2         | 716                  | 2,043                                       | 29   | 17                  | 2,805   | 83                   | 2,888                                     |                |
| 3         | 402                  | 1,039                                       | 298  | 60                  | 1,799   | 168                  | 1,967                                     |                |
| 4         | 73                   | 203   | 34   | --                  | 310     | 70                   | 380                                       |                |
| 5         | 379                  | 1,949                                       | 679  | 33                  | 3,040   | --                   | 3,040                                     |                |
| 6         | 1,634                | 4,202                                       | 238  | 96                  | 6,170   | 800                  | 6,970                                     |                |
| 7         | 1,369                | 4,095                                       | 1,547  | 240                 | 7,251   | 660                  | 7,911                                     |                |
| 8         | 3,750                | 4,822                                       | 3,296  | --                  | 11,868  | 8,463                | 20,331                                    |                |
| 9         | 5,626                | 9,866                                       | 17,140   | 1,933               | 34,565  | 5,379                | 39,944                                    |                |
| 10        | 8,756                | 10,369                                      | 14,535   | --                  | 33,660  | 2,253                | 35,913                                    |                |
| 11        | 4,501                | 7,484                                       | 8,645  | 885                 | 21,515  | 9,845                | 31,360                                    |                |
| 12        | 82                   | 1,092                                       | 31   | --                  | 1,205   | --                   | 1,205                                     |                |
| C-NP      | 29,734               | 55,300                                      | 52,284   | 1/                  | 137,318 | 28,471 <sup>2/</sup> | 165,789 <sup>2/</sup>                     |                |

1/ Data for "All other, (SIC 24)" have been combined with "SIC 243" to avoid disclosure of figures for individual companies.

2/ Totals differ from the official State totals because of modifications made in the data for several subregions to avoid disclosing figures for individual companies.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

of logs from federal lands. The law came into being after the projections were made for this study; however, the recent developments indicate that the projections will not be significantly affected.

### Employment

There has been a long-term downward trend in total forest industry employment due, in part, to increases in productivity. But this influence which reduces employment has been somewhat offset by changes in industry mix and the increase in further manufacturing. Employment in logging, sawmills, and planing mills has been declining since 1950, and that in miscellaneous wood manufacturing has been relatively stable. Employment in plywood plants and the pulp, paper and allied products industry has been increasing over the past 15 years. In 1950, about 169,000 workers were employed by the forest industries of the region, and in 1965 the employment level was nearly three percent lower at 165,789 workers. Because of the excellent business conditions in 1965 and the intensive use of plant capacity, employment levels in that year were above the long-term average.

In 1965, the State of Oregon, exclusive of Klamath County, had the largest forest industry employment in the region (78,765), Washington was second (66,724), and Idaho was third (12,385). The Willamette Subregion had the largest forest industry employment of any subregion--39,944. The Coastal Subregion ranked second with 35,913 workers, and the Puget Sound Subregion ranked third with 31,360 workers (table 15).

Although the manufacture of lumber provides the most employment in the forest industry for the region as a whole, it leads the other major forest industries in only Idaho and western Montana. Here, employment in sawmills and planing mills (SIC<sup>1/</sup> 242) accounted for 7,719 and 4,740 employees, respectively, in 1965. In Washington the pulp, paper and allied products industry (SIC 26) was the leading employer with 19,789 workers. Sawmills and planing mills (SIC 2421) in Washington ranked second with 16,421 workers; whereas, veneer and plywood plants (SIC 2432) ranked third with 10,480 workers. In all of Oregon, including Klamath County, the veneer and plywood industry (SIC 2432) was the largest single forest industry employer with 27,629 workers in 1965; sawmills and planing mills (SIC 2421) ranked second with 25,510 employees.

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<sup>1/</sup> Standard Industrial Classification.



The employment data are based on statistics compiled by the respective state employment agencies. Employment totals presented in the detailed table may differ slightly from official figures because, when disclosure of covered employment for individual mills was a possibility, estimates of employment were developed based on average data for the industry.

#### THE FUTURE FOREST ECONOMY

The forest economy of the Columbia-North Pacific Region has been projected in terms of wood consumption, employment, and payrolls for the 1965-2020 period. The basic wood consumption projections were made first on a regional and half-state basis; then they were allocated to subregions on the basis of existing industry distribution. However, in some cases such as in the pulp, paper, and allied products industry, allowance was made for new plant investment at new industrial sites in the various subregions.

The timber economy of the region has been changing in several ways which differ from those foreseen several years ago in studies such as "Timber Trends in the United States" and "Prospective Economic Developments Based on the Timber Resources of the Pacific Northwest." For example, the demand for logs for foreign exports is much greater; eastern Oregon's projected increase in consumption of wood has not materialized; southern plywood production has captured more of the nation's plywood market than projected; production of veneer and plywood has turned downward in western Oregon and western Washington, while that industry's output has increased more in the inland portion of the region than was projected; and public agencies have raised their annual allowable cuts in many areas. The increasing demand for all forest resources has been rapidly changing the outlook for both public and private owners concerning their timber production alternatives. Thus, for this study, a new look has been taken at the timber economy. As a result, the new projections of wood consumption by the forest industries differ from earlier studies such as the Willamette River Basin Report and the Puget Sound and Adjacent Waters Report.

#### Future National Demand for Wood Products

The principal markets for forest products of the region are distributed over the whole nation. It is assumed that the future production of the forest industries of the Pacific Northwest will be strongly influenced by national demand. Also, the increasing worldwide demand for wood products, especially from the Pacific Rim countries, will continue to exert strong



pressure to divert materials produced in the Pacific Northwest away from the nation's marketplace. As a result, more wood will be demanded in future time periods.

National trends in quantities of wood products which will be demanded have been projected by the Forest Service (66). The projections were based on five major factors. These included population, household formation, gross national product, disposable personal income, and construction activity.

Total demand for lumber in the United States is projected to increase 22 percent between 1962 and 1985, even though lumber demand per capita is expected to decline (table 16). Plywood and veneer demand should double by 1985, with the south expected to supply an increasing share of the future market. Paper and board demand per capita should continue to increase so that total demand will continue to rise throughout the projection period at historic rates. The projections indicated that the demand for minor industrial products will remain about the same, while consumption of fuelwood is expected to decline. Although the domestic forests are expected to meet most of the increase in the nation's future demand, imports of lumber, veneer logs, and pulpwood are nevertheless expected to increase in the future.

#### The Timber Supply Situation

The timber supply situation has been studied for each state. The relationship of the forest economy to the physical timber supply is complex, for it involves not only timber demands, but the goals of the various forest landowners. Consideration has been given to trends in log production, land use, forest growth, forest mortality, forest inventory, forest ownership, and anticipated owner goals in making projections of the available timber supplies for the future. Many of these timber supply relationships have been derived from earlier studies and others have been prepared specifically for this study.

Projecting the acreage available for future timber production posed complex problems in this study. It was generally assumed that the present regional trends in forest land loss will continue in the future. It was also assumed that the private forest land adjacent to Puget Sound would not have commercial harvests after 1985. On the other hand, it was assumed that logging technology will continue to improve, allowing timber harvests on forest land which cannot be logged by today's standards due to soil instability or steepness. These lands are classed as commercial forest lands in this study because they are capable of producing adequate timber yields.

Table 16 - Summary of Total Demand for Major Timber Products,  
1952 and 1962, with Projections to 1985, United States

| Product             | Standard unit<br>of measure            | 1952   | 1962   | 1970   | 1975   | 1980   | 1985   |
|---------------------|--|--------|--------|--------|--------|--------|--------|
| Lumber:             |  |        |        |        |        |        |        |
| Total               | Million board feet                     | 41,460 | 37,300 | 39,700 | 41,600 | 43,400 | 45,500 |
| Per capita          | Board feet                             | 263    | 200    | 191    | 187    | 180    | 175    |
| Plywood and veneer: |  |        |        |        |        |        |        |
| Softwoods           | Million square feet,<br>3/8-inch basis | --     | 9,250  | 14,400 | 15,600 | 17,000 | 18,500 |
| Hardwoods           | Million square feet,<br>3/8-inch basis | --     | 2,770  | 3,500  | 4,200  | 5,000  | 5,700  |
| Total               |  | --     | 12,020 | 17,900 | 19,800 | 22,000 | 24,200 |
| Per capita          | Square feet                            | --     | 64     | 86     | 89     | 91     | 93     |
| Woodpulp:           |  |        |        |        |        |        |        |
| Total               | Million tons                           | --     | 29.5   | 38.2   | 44.8   | 52.4   | 60.5   |
| Paper and board:    |  |        |        |        |        |        |        |
| Total               | Million tons                           | --     | 42.4   | 52.7   | 60.2   | 69.3   | 79.2   |
| Per Capita          | Pounds                                 | --     | 454    | 507    | 540    | 575    | 609    |

Source: Timber Trends in the United States.

Even though western Oregon has a large part of the nation's best forest-growing land, the future timber harvest in western Oregon will not be adequate to maintain the present level of wood consumption if present downward trends in private production continue and if present allowable cuts on the public lands are adhered to. This situation reflects the history of heavy cutting on private lands, leaving inventories of sawtimber at a low level, thus limiting the economically available supply of private timber. As evidence of this, log production from private lands has a distinct downward trend, even though prices for stumpage have been increasing.

It is assumed that this trend toward lower private production will continue until cut and net growth come more into balance. The tendency toward higher stumpage prices and the expectation of increasing future demand for wood is assumed to be a motivating force in attracting a moderate level of continued reinvestment in private forestry, bringing these lands into a sustained level of physical production. This level will be much lower than the private timber harvest in 1965.

The public agencies in the Douglas-fir area are now evaluating alternatives in managing their own forest resources. They are considering their forest production alternatives in relation to projected private timber production and are studying the effect on the economy of alternative courses of cutting action. On the basis of these studies, future policy regarding timber harvests will be formulated.

It has been assumed for this study that the public agencies in western Oregon will increase their timber harvests above the 1965 levels as private production declines. The public effort will nearly stabilize the total flow of roundwood during most of the 1970-2020 projection period at a point somewhat below the 1965 harvest. As a result of this assumption, the level of economic activity projected in this study for western Oregon may be regarded as a high projection for it implies rather large investments by the public in forestry activities.

In western Washington, the period of heavy private cutting came earlier than in western Oregon. Lumbermen began cutting the private lands in the mid-1800's and the private harvest reached its peak in the 1920's. Because this is an easily reforested area, most of the private lands regenerated quickly and now have a young, fast-growing inventory. In addition, substantial areas of old growth remain which are still being harvested. The harvest on private lands is once again moving upward, stimulated by increasingly higher stumpage prices, new logging technology, and increased market acceptability of

smaller timber. An increase in the harvest is projected to continue in the 1965-2020 period.

Public owners have been increasing their allowable cuts in the state of Washington. The Department of Natural Resources recently evaluated the potential of their lands and greatly raised their planned harvests based on new inventory data and an accelerated thinning program. The Bureau of Indian Affairs has accelerated the Indian timber harvests for about a 15 year period in western Washington. The Forest Service has been increasing their allowable cut and it has been assumed for this study that further increases will take place.

The production of logs in eastern Oregon has been increasing since the 1940's with most of the increase coming from the national forests. During the past decade the harvest from private lands has decreased.

Eastern Oregon is projected to have an increasing demand for raw materials as timber supplies become limited west of the Cascade Range. The prices for east-side timber should rise and, as a result, private landowners will eventually increase their log production (21)(22).

Eastern Washington's forest economy has been generally growing since 1932 with more rapid growth in recent years. Like eastern Oregon, the public agencies have been supplying the increased raw material used in the past decade, with private log production data showing a slight downward trend in the past 10 year period.

Log production from public lands is projected to increase in eastern Washington during the 1965-2020 period. The projected growth of eastern Washington's forest industries will stimulate an increase in private log production in the future. Because of the favorable net growth relationships projected for private lands, it is expected that the inventory can sustain a much higher level of harvesting activity than in the past.

The timber economy of the Idaho and western Montana area will continue to grow during the 1965-2020 projection period, assuming the demands for timber products in the nation continue to rise as projected and that new logging and wood processing technology enable manufacturers to hold costs at levels allowing them to compete in the nation's marketplace.

Idaho and western Montana have a large but under-utilized forest resource. For many years the national demand for timber was met by available timber supplies in other areas of the country and the lower quality timber of the Rocky Mountain area



was not used. The increasing demand for timber products has resulted in a trend toward intensive use of all forest lands, including even the less productive segment of the commercial forest land. In the 1960's the forest economy in Idaho and western Montana began to broaden and develop. It is anticipated that, as industrial growth continues, more of the less productive and presently inaccessible commercial forest land in Idaho and western Montana will be included in the timber-producing base.

The production levels established for this area are based on the projections made by the Forest Service (66). The projections for private lands were changed to bring future levels of cut and net growth more in line in order to sustain a vigorous timber inventory. National forests account for the largest part of the projected increase in future timber harvests in Idaho and western Montana and it is assumed that they will make the large investments in forestry required to produce these projected timber volumes.

#### Roundwood Consumption by Lumber and Wood Products Industry

In 1965 the lumber and wood products industry (SIC 24) and foreign log exports consumed 3.5 billion cubic feet of roundwood in the region (table 17). During the 1965-2020 projection period the roundwood consumption by this group of forest-based industries will decline 11 percent; whereas, the roundwood consumption by the pulp and paper industry (SIC 26) will increase.

It has been assumed in making these projections that when raw material is scarce the forest industry, which adds the most value to its wood input during the manufacturing process, will be better able to outbid other wood users for the resource. For example, plywood plants and log exporters have increased their shares of total timber harvest at the expense of sawmills in the Douglas-fir region. In making projections for the region it was assumed, based on present trends, that the distribution of timber harvest among its various end uses will continue to change. The degree of change will vary by subregions, depending on the availability of timber supply.

#### Saw Log Consumption

In 1965, sawmills consumed 2.3 billion cubic feet of roundwood. By the year 2020, saw log consumption in the region is projected to decline 29 percent to 1.7 billion cubic feet (table 18). This decline takes place despite the projected increased national demand. The downward projection reflects the



assumption that many of the lumber industry's historical problems will continue into the future. The lumber industry is highly competitive; there are good substitutes for lumber and increased costs of doing business cannot easily be passed on to the consumer. The costs of doing business in the lumber industry have risen, especially in the form of stumpage and labor costs. The price of the end product has been relatively stable, tending to squeeze out the profits of the sawmill. In part, this may explain why so many sawmills have been going out of business. With the projected increased demands for other uses of stumpage by the plywood and the pulp industries, it is expected that the sawmill will be at a relative disadvantage in acquiring raw material and, as a result, its share of the region's timber harvest will decline.

Table 17 - Roundwood Consumption by the Lumber and Wood Products Industry - 1965, with Projections for 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions 1/

| Subregion | 1965                 | 1980  | 2000  | 2020  |
|-----------|----------------------|-------|-------|-------|
|           | (Million Cubic Feet) |       |       |       |
| 1         | 385                  | 380   | 350   | 336   |
| 2         | 92                   | 125   | 143   | 150   |
| 3         | 54                   | 75    | 91    | 100   |
| 4         | 7                    | 8     | 8     | 7     |
| 5         | 67                   | 75    | 82    | 76    |
| 6         | 195                  | 228   | 249   | 236   |
| 7         | 219                  | 239   | 255   | 269   |
| 8         | 294                  | 271   | 281   | 259   |
| 9         | 836                  | 580   | 575   | 606   |
| 10        | 916                  | 755   | 707   | 670   |
| 11        | 406                  | 472   | 457   | 385   |
| 12        | 28                   | 29    | 29    | 30    |
| C-NP      | 3,499                | 3,237 | 3,227 | 3,124 |

1/ Includes foreign log exports.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Exp. Sta., Portland, Oregon, February 1969.

#### Veneer Log Consumption

Veneer and plywood plants consumed 878 million cubic feet of roundwood in 1965 in the Columbia-North Pacific Region. The growth of the plywood industry reflects its favorable competitive

position among building materials and the technological breakthroughs in economically peeling smaller and rougher logs. In the long run, it has been assumed that the plywood industry will continue to increase, although not at its historical rate. The total consumption of veneer logs is projected to increase 40 percent to 1.2 billion cubic feet during the 1965-2020 period (table 18).

Table 18 - Roundwood Consumption by the Lumber and Wood Products Industry by Type of Use, 1965, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region

| Type of Use         | 1965                 | 1980  | 2000  | 2020  |
|---------------------|----------------------|-------|-------|-------|
|                     | (Million Cubic Feet) |       |       |       |
| Veneer              | 878                  | 926   | 1,112 | 1,228 |
| Saw logs            | 2,343                | 1,819 | 1,734 | 1,663 |
| Misc. wood products | 128 <sup>2/</sup>    | 155   | 186   | 176   |
| Foreign log exports | 150                  | 337   | 195   | 57    |
| Total roundwood     | 3,499                | 3,237 | 3,227 | 3,124 |

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Exp. Sta., Portland, Oregon, February 1969.

#### Roundwood Consumption for Miscellaneous Wood Products

The estimated trend level of roundwood consumption for miscellaneous products in 1965 was 128 million cubic feet. Miscellaneous products include such products as poles, pilings, posts, fuelwood, and shingles. The miscellaneous products roundwood consumption is projected to increase by 48 million cubic feet to 176 million cubic feet in 2020 (table 18). It is likely that the mix of miscellaneous products will change by 2020, with increasing emphasis on manufacturing in future time periods.

#### Foreign Log Exports

The quantities of timber demanded by foreign countries along the Pacific Rim is projected to increase during the early part of the Projection period. Experience has shown

that log exporters have been effective in purchasing their timber requirements from this region. The export of roundwood is projected to increase 2.2 times to 337 million cubic feet between 1965 and 1980 with most of the increase coming during the 1960's (table 18). Log exports are expected to decline starting in 1980 because of the increasing demand for roundwood in the United States, the increasing availability of wood from countries such as the Soviet Union, and the increasing domestic production of roundwood in Japan (13). By 2020 they are projected to amount to 57 million cubic feet, which is 38 percent of the log export volume in 1965.

In 1965, sawmills, planing mills, veneer plants, and plywood plants in the region produced 8.2 million tons of coarse residue, four million tons of sawdust, and 2.8 million tons of shavings. Projections of potential mill residue production are based on the projected output of lumber and veneer. Because the projected decline in lumber production will more than offset the increase in veneer production, the output of mill residue will also decline. Coarse residue production is projected to decline 11 percent to 7.3 million tons by 2020; sawdust production will drop 29 percent to 2.9 million tons; and shaving production will drop 30 percent to about two million tons (table 19).

Table 19 - Production of Mill Residue, 1965, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region 1/

| Type of Residue | 1965  | 1980            | 2000  | 2020  |
|-----------------|-------|-----------------|-------|-------|
|                 |       | (Thousand Tons) |       |       |
| Coarse          | 8,186 | 6,954           | 7,180 | 7,295 |
| Sawdust         | 4,065 | 3,166           | 3,015 | 2,899 |
| Shavings        | 2,807 | 2,143           | 2,032 | 1,952 |

1/ Assumes no change in utilization of roundwood.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Exp. Sta., Portland, Oregon, February 1969.

### Pulpwood Consumption

In 1965 an estimated 839 million cubic feet of pulpwood was consumed by pulpmills in the region. It was estimated that 68 percent of this total wood fiber consumption (567 million cubic feet) was residue from the lumber and wood products industry.

By the year 2020 the total wood consumption by the pulp, paper, and allied products industry is projected to increase 1.6 times to 2.2 billion cubic feet (table 20). As the available supply of plant residues becomes fully utilized an increasing part of pulpwood production will come from roundwood sources. It is projected that roundwood consumption by pulpmills will increase from 272 million cubic feet in 1965 to 1.4 billion cubic feet in 2020. Roundwood will then account for 65 percent of the total pulpwood consumption rather than the present 32 percent.

Table 20 - Wood Consumption by the Paper and Allied Products Industry, 1965, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions. <sup>1/</sup>

| Subregion | 1965                 | 1980  | 2000  | 2020  |
|-----------|----------------------|-------|-------|-------|
|           | (Million Cubic Feet) |       |       |       |
| 1         | 59                   | 115   | 194   | 212   |
| 2         | 3                    | 8     | 13    | 20    |
| 3         | --                   | --    | --    | --    |
| 4         | --                   | --    | 12    | 35    |
| 5         | --                   | 14    | 37    | 75    |
| 6         | 48                   | 58    | 66    | 75    |
| 7         | 38                   | 51    | 81    | 89    |
| 8         | 249                  | 368   | 529   | 575   |
| 9         | 95                   | 203   | 257   | 267   |
| 10        | 106                  | 201   | 264   | 280   |
| 11        | 241                  | 342   | 499   | 546   |
| 12        | --                   | --    | --    | --    |
| C-NP      | 839                  | 1,360 | 1,952 | 2,174 |

<sup>1/</sup> Includes hardboard industry data.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

Almost every subregion is assumed to share in the expansion of the pulp, paper, and allied products industry, but Subregions 8 and 10 will remain the most important pulpwood-consuming areas in the region with 575 million cubic feet and 546 million cubic feet of wood consumption, respectively, in 2020.

#### Forest Industry Employment

Projections of forest industry employment have been made for selected years during the 1965-2020 period for the Columbia-North Pacific Region. The historical relationship between employment and wood input was studied for the period 1950 to 1965 for the major forest industries in broad areas within each state except for Idaho and western Montana, where state data was generally combined. Regressions were developed for SIC 2411, logging; SIC 2421, sawmills and planing mills; SIC 2432, veneer and plywood; and SIC 26, pulp, paper, and allied products. The historic trend in the employment-consumption relationship was projected to 2020 for each forest industry. Using this and the projected wood consumption by industry, future forest-based employment was calculated for the subregions. In this text, and the following tables, the employment projections have not been rounded so that data for small geographic areas can be added and reconciled with various regional totals. This is not meant to imply that the projections are accurate to the detail shown.

Log sizes are changing, worker productivity is increasing, log utilization is improving, and the work week has been getting shorter. These various factors are reflected in the trend of the employment-consumption relationship, even though each individual factor influences employment differently. Thus, the method of projecting employment implicitly takes into account a number of factors which have been changing and assumes that the same trends will continue in the future.

Total forest industry employment is projected to decline 37 percent during the 1965-2020 period to about 104,000 (table 21). This decline is entirely the result of decreased employment in the lumber and wood products industry where increasing worker productivity, coupled with a declining projected wood consumption, is projected to reduce employment 46 percent during the 1965-2020 period. Total employment in the lumber and wood products industry is projected to be 73,816 in 2020, compared to 137,318 in 1965.

Pulp, paper, and allied products employment is projected to increase six percent to 30,189 employees. This increase reflects the rapid growth which is projected for the industry.



Table 21 - Forest Industry Employment by Industry Group, 1965, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregion | Industry Group         | Standard<br>Industrial<br>Classification | 1965    | 1980    | 2000    | 2020    |
|-----------|------------------------|--|---------|---------|---------|---------|
|           |                        | Code                                     |         |         |         |         |
|           |                        | (Number of Persons)                      |         |         |         |         |
| 1         | Lumber & wood products | 24                                       | 13,130  | 10,811  | 8,261   | 7,143   |
|           | Pulp & paper           | 26                                       | 750     | 922     | 1,140   | 1,161   |
|           | Total                  |  | 13,880  | 11,733  | 9,401   | 8,304   |
| 2         | Lumber & wood products | 24                                       | 2,805   | 3,003   | 2,469   | 2,055   |
|           | Pulp & paper           | 26                                       | 83      | 83      | 76      | 79      |
|           | Total                  |  | 2,888   | 3,086   | 2,545   | 2,134   |
| 3         | Lumber & wood products | 24                                       | 1,799   | 1,981   | 1,741   | 1,570   |
|           | Pulp & paper           | 26                                       | 168     | 254     | 300     | 306     |
|           | Total                  |  | 1,967   | 2,235   | 2,041   | 1,876   |
| 4         | Lumber & wood products | 24                                       | 310     | 297     | 240     | 200     |
|           | Pulp & paper           | 26                                       | 70      | 76      | 227     | 454     |
|           | Total                  |  | 380     | 373     | 467     | 654     |
| 5         | Lumber & wood products | 24                                       | 3,040   | 3,167   | 2,707   | 2,374   |
|           | Pulp & paper           | 26                                       | --      | 222     | 479     | 822     |
|           | Total                  |  | 3,040   | 3,389   | 3,186   | 3,196   |
| 6         | Lumber & wood products | 24                                       | 6,170   | 5,094   | 3,824   | 2,865   |
|           | Pulp & paper           | 26                                       | 800     | 841     | 784     | 752     |
|           | Total                  |  | 6,970   | 5,935   | 4,608   | 3,617   |
| 7         | Lumber & wood products | 24                                       | 7,251   | 6,072   | 5,081   | 4,427   |
|           | Pulp & paper           | 26                                       | 660     | 884     | 1,142   | 1,022   |
|           | Total                  |  | 7,911   | 6,956   | 6,223   | 5,449   |
| 8         | Lumber & wood products | 24                                       | 11,868  | 8,560   | 7,012   | 5,694   |
|           | Pulp & paper           | 26                                       | 8,463   | 9,224   | 9,578   | 8,172   |
|           | Total                  |  | 20,331  | 17,784  | 16,590  | 13,866  |
| 9         | Lumber & wood products | 24                                       | 34,565  | 23,226  | 19,527  | 17,949  |
|           | Pulp & paper           | 26                                       | 5,379   | 7,607   | 7,060   | 5,782   |
|           | Total                  |  | 39,944  | 30,833  | 26,587  | 23,731  |
| 10        | Lumber & wood products | 24                                       | 33,660  | 22,770  | 18,686  | 16,505  |
|           | Pulp & paper           | 26                                       | 2,253   | 2,756   | 2,728   | 2,288   |
|           | Total                  |  | 35,913  | 25,526  | 21,414  | 18,793  |
| 11        | Lumber & wood products | 24                                       | 21,515  | 16,944  | 14,670  | 12,601  |
|           | Pulp & paper           | 26                                       | 9,845   | 10,311  | 10,896  | 9,351   |
|           | Total                  |  | 31,360  | 27,255  | 25,566  | 21,952  |
| 12        | Lumber & wood products | 24                                       | 1,205   | 804     | 564     | 433     |
|           | Pulp & paper           | 26                                       | --      | --      | --      | --      |
|           | Total                  |  | 1,205   | 804     | 564     | 433     |
| C-NP      | Lumber & wood products | 24                                       | 137,318 | 102,729 | 84,782  | 73,816  |
|           | Pulp & paper           | 26                                       | 28,471  | 33,180  | 34,410  | 30,189  |
|           | Total                  |  | 165,789 | 135,909 | 119,192 | 104,005 |

Source: Wall, Brian R., *Projected Developments of the Timber Economy of the Columbia-North Pacific Region*, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

Washington State is projected to lead in forest employment by 2020 (46,932), with Oregon dropping to second (44,012). Idaho will have 8,657 forest industry employees in 2020 and western Montana will have 4,404 employees (tables 21 and 22).

Table 22 - Employment in Forest Management, 1962, with Projections to 1980, 2000, and 2020, United States, Columbia-North Pacific Region and Subregions 1/ 2/

| Subregion | 1962                | 1980    | 2000    | 2020    |
|-----------|---------------------|---------|---------|---------|
|           | (Number of Persons) |         |         |         |
| 1         | 1,572               | 2,246   | 3,340   | 4,185   |
| 2         | 436                 | 622     | 926     | 1,160   |
| 3         | 318                 | 455     | 677     | 848     |
| 4         | 61                  | 88      | 130     | 163     |
| 5         | 402                 | 575     | 856     | 1,072   |
| 6         | 840                 | 1,200   | 1,786   | 2,237   |
| 7         | 836                 | 1,195   | 1,778   | 2,227   |
| 8         | 1,990               | 2,843   | 4,230   | 5,298   |
| 9         | 3,085               | 4,404   | 6,558   | 8,216   |
| 10        | 5,352               | 7,646   | 11,376  | 14,250  |
| 11        | 2,324               | 3,321   | 4,940   | 6,189   |
| 12        | 284                 | 405     | 603     | 755     |
| C-NP      | 17,500              | 25,000  | 37,200  | 46,600  |
| U.S.      | 90,800              | 129,300 | 191,600 | 239,900 |

1/ The protection and management for the production of timber and related products.

2/ Allocation of forest management employment to subregions was based on 1964 timber harvest relationships.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

#### Forest Management Employment

In 1962 it was estimated that the number of persons employed in forest management amounted to 17,500. Forest management employment includes all workers, both publicly or privately engaged in the protection and management of forest lands for the production of timber and related products. It also includes

the time worked by part-time employees and forest owners converted to an equivalent full-time basis.<sup>1/</sup>

The trend toward more intensive forest management on all forest lands in the region will continue in the 1962-2020 period. More forest management personnel will be needed as the multiple uses of forest lands are stressed and it is projected that forest management employment will increase 1.7 times during the study period to 46,600 persons in the year 2020 (table 22).

#### Forest-Related Payrolls

In 1962, worker incomes in all forest-related activities amounted to \$945 million. Workers in the lumber and wood products industry received 73 percent of the total; those in pulp, paper, and allied products received 18 percent; and forest management employees received nine percent of the total 1962 payroll in the forest economy. Between 1965 and 2020, total payrolls in the forest economy are projected to increase 1.4 times to a total of about \$2.3 billion. Payrolls are assumed to increase commensurate with worker productivity. Payrolls in the lumber and wood products industry in 2020 will amount to 34 percent of the total, or \$765 million; whereas, the pulp, paper and allied products payroll will be \$537 million, or 23 percent. Forest management payrolls are projected to be \$975 million in 2020, or 43 percent of the total (table 23).

#### SUMMARY

The Columbia-North Pacific Region has a large timber resource and a large forest industry based on that resource. After more than a century, lumber is still the primary forest product. Manufacture of pulp, paper, and allied products, veneer and plywood, and board products, has been, and will continue to be, of increasing importance. With the nation's population increasing and personal incomes rising, the demand for timber products will increase. However, limited timber supply will be a constraint on the growth of the timber economy.

The forest industry's period of most rapid growth can probably be regarded as past history. While continued growth of forest production can be expected, it will be at a much

<sup>1/</sup> Based on a concept of forest management developed in "The economic importance of timber in the United States," U.S.D.A. Forest Service, Misc. Pub. 941, July 1963.

Table 23 - Forest Industry Income (Payrolls) by Industry Group, 1962, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregion | Industry Group          | Standard Industrial Classification Code | 1962 1980 2000 2020   |         |         |         |
|-----------|-------------------------|---|-----------------------|---------|---------|---------|
|           |                         |   | (Thousand Dollars) 1/ |         |         |         |
| 1         | Lumber & wood products  | 24                                      | 66,273                | 82,207  | 77,026  | 74,059  |
|           | Pulp & paper            | 26                                      | 4,061                 | 9,338   | 15,981  | 20,662  |
|           | Forest management 2/ 3/ |   | 7,858                 | 17,502  | 42,655  | 87,582  |
| 2         | Lumber & wood products  | 24                                      | 13,842                | 22,835  | 23,021  | 21,306  |
|           | Pulp & paper            | 26                                      | 536                   | 841     | 1,065   | 1,405   |
|           | Forest management       |   | 2,179                 | 4,853   | 11,828  | 24,285  |
| 3         | Lumber & wood products  | 24                                      | 8,876                 | 15,064  | 16,233  | 16,278  |
|           | Pulp & paper            | 26                                      | 1,001                 | 2,573   | 4,205   | 5,446   |
|           | Forest management       |   | 1,592                 | 3,547   | 8,645   | 17,750  |
| 4         | Lumber & wood products  | 24                                      | 1,613                 | 2,258   | 2,238   | 2,074   |
|           | Pulp & paper            | 26                                      | 452                   | 769     | 3,182   | 8,080   |
|           | Forest management       |   | 306                   | 682     | 1,662   | 3,414   |
| 5         | Lumber & wood products  | 24                                      | 15,697                | 24,081  | 25,240  | 24,614  |
|           | Pulp & paper            | 26                                      | --                    | 2,248   | 6,715   | 14,629  |
|           | Forest management       |   | 2,012                 | 4,483   | 10,925  | 22,432  |
| 6         | Lumber & wood products  | 24                                      | 31,818                | 38,735  | 35,655  | 29,704  |
|           | Pulp & paper            | 26                                      | 5,003                 | 8,518   | 10,990  | 13,383  |
|           | Forest management       |   | 4,200                 | 9,355   | 22,800  | 46,814  |
| 7         | Lumber & wood products  | 24                                      | 36,143                | 46,171  | 47,375  | 45,899  |
|           | Pulp & paper            | 26                                      | 4,003                 | 8,953   | 16,009  | 18,189  |
|           | Forest management       |   | 4,182                 | 9,316   | 22,705  | 46,619  |
| 8         | Lumber & wood products  | 24                                      | 58,649                | 65,090  | 65,379  | 59,035  |
|           | Pulp & paper            | 26                                      | 50,764                | 93,421  | 134,264 | 145,437 |
|           | Forest management       |   | 9,949                 | 22,160  | 54,008  | 110,892 |
| 9         | Lumber & wood products  | 24                                      | 172,685               | 176,611 | 182,070 | 186,095 |
|           | Pulp & paper            | 26                                      | 33,416                | 77,043  | 98,967  | 102,902 |
|           | Forest management       |   | 15,426                | 34,361  | 83,742  | 171,945 |
| 10        | Lumber & wood products  | 24                                      | 167,740               | 173,143 | 174,228 | 171,124 |
|           | Pulp & paper            | 26                                      | 13,693                | 27,913  | 38,241  | 40,720  |
|           | Forest management       |   | 26,758                | 59,601  | 145,255 | 298,247 |
| 11        | Lumber & wood products  | 24                                      | 106,196               | 128,842 | 136,783 | 130,647 |
|           | Pulp & paper            | 26                                      | 58,801                | 104,430 | 152,740 | 166,420 |
|           | Forest management       |   | 11,620                | 25,883  | 63,080  | 129,520 |
| 12        | Lumber & wood products  | 24                                      | 6,018                 | 6,114   | 5,259   | 4,489   |
|           | Pulp & paper            | 26                                      | --                    | --      | --      | --      |
|           | Forest management       |   | 1,418                 | 3,157   | 7,695   | 15,800  |
| C-NP      | Lumber & wood products  | 24                                      | 685,550               | 781,151 | 790,507 | 765,324 |
|           | Pulp & paper            | 26                                      | 171,730               | 336,047 | 482,359 | 537,273 |
|           | Forest management       |   | 87,500                | 194,900 | 475,000 | 975,300 |

1/ 1962 Constant Dollars

2/ The protection and management of forests for the production of timber and related products.

3/ Allocation of forest management employment and payrolls to subregions was based on 1964 timber harvest relationships.

Source: Wall, Brian R., Projected Developments of the Timber Economy of the Columbia-North Pacific Region, USDA, Forest Service, Pacific Northwest Forest & Range Experiment Station, Portland, Oregon, February 1969.

slower rate and employment may be expected to decline. In those areas with major untapped timber supplies, the industry can be expected to grow faster than in the region as a whole. Generally, this new expansion will occur east of the Cascade Range.

With the shift in the product mix and the leveling off of wood fiber consumption in the future, the characteristics of the industry will continue to change. There will be fewer lumber mills and plywood plants but the average capacity per mill will increase. Because of the need for better utilization of wood in such a competitive wood market, firms will tend to continue their integration of wood processing facilities. The capital supply, the raw material supply, the technical skills required, and the long-range outlook required suggest a continuing trend toward more mergers and consolidation of forest land ownership. The forest industry labor force will be shifting from lumber manufacture to plywood manufacture, pulp and paper processing, and secondary manufacturing of wood products.

As markets continue to expand within the region, new types of industry will be attracted and the region will become less dependent on its timber economy. However, due to the nature of the forest industries and their tendency to locate near raw material supplies, many smaller communities will continue to be highly dependent on timber-based activities.

The projected population increase in the region and the nation will act as a constraint on timber supply. People need water, roads, power, industrial sites, recreation areas and home sites, and forested land is frequently required to fulfill these needs. For example, when forests are taken out of production for roads, powerlines and homesites, this, in effect, reduces the long-run potential supply of timber and it is possible that consumers may have to pay higher prices for timber products in the future. Recreation use also removes some forest land from production. It is assumed that present trends in forest land loss would continue in the region and the projections of wood fiber consumption reflect this limitation.

Man is more and more concerned with his environment and how it is affected by industrial activity. Allowance was made for this concern in making projections and it has been assumed that technology of pollution abatement will advance sufficiently to allow the projections of consumption to be realized. Economic activity ought to make man better off. It is hoped that, in some measure, this study of the timber economy will contribute to that end.



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## AGRICULTURE IN THE REGION'S ECONOMY

### CHARACTERISTICS OF AGRICULTURE

Agriculture is an important industry in the economy of the Columbia-North Pacific Region. In 1964 the value of agricultural commodities produced exceeded \$1.5 billion. About 60 percent of the value was from crops and 40 percent from livestock and poultry. The industry utilizes a significant proportion of the region's land and water resources for producing a great variety of agricultural commodities. About a third of the land area is in farms, and extensive quantities of publicly owned land are utilized by livestock for grazing. Of the 21 million acres of cropland, about seven million acres were irrigated in 1966. In 1960, approximately 156 thousand persons were employed in agriculture and about eight percent (443 thousand) of the region's population was classified as rural farm.

Farm and farm characteristics of the region and subregions in 1964 are presented in table 24. In 1964 there were approximately 117 thousand farms in the region. Since 1949 the number decreased by nearly 56 thousand (over 30 percent). They have also decreased in all subregions, however, the rates of decline vary considerably between subregions. Generally, the subregions west of the Cascades have experienced greater rates of decline than those east of the Cascades. In Subregion 2, which contains the Columbia Basin project, the decrease in number of farms was only three percent.

From 1949 to 1964, land in farms increased from 52 million acres to about 57 million acres. Subregions west of the Cascades experienced a decline of land in farms, while those east of the Cascades generally had an expansion of acreage of land in farms.

The average size of farm in the region was about 482 acres in 1964. This was an increase of about 180 acres per farm from 1949. Average farm sizes range from as low as 71 acres in the Puget Sound Subregion to over 3,700 acres in the Closed Basin. These size differentials are associated with the type of farming enterprises in the respective subregions. The average size of farm has increased substantially in all subregions since 1949.

The decrease in land in farms and decrease of farm numbers

Table 24 - Farms and Farm Characteristics, Columbia-North Pacific Region and Subregions, 1964 1/

| Subject                      | Unit | C-NP       | SUB REGION |           |           |           |           |           |            |         |           |           |           |           |
|------------------------------|------|------------|------------|-----------|-----------|-----------|-----------|-----------|------------|---------|-----------|-----------|-----------|-----------|
|                              |      |            | 1          | 2         | 3         | 4         | 5         | 6         | 7          | 8       | 9         | 10        | 11        | 12        |
| Farms                        | No.  | 117,448    | 10,203     | 9,730     | 7,426     | 14,140    | 10,392    | 7,054     | 7,289      | 7,204   | 20,366    | 8,534     | 14,488    | 622       |
| Land in farms                | Acre | 56,648,966 | 5,496,728  | 8,721,958 | 3,334,257 | 7,371,769 | 5,995,389 | 6,090,990 | 11,287,717 | 645,784 | 2,423,638 | 1,916,580 | 1,032,512 | 2,331,674 |
| Average size of farm         | Acre | 482        | 540        | 896       | 449       | 521       | 577       | 864       | 1,549      | 90      | 119       | 225       | 71        | 3,749     |
| Farms by type:               |      |            |            |           |           |           |           |           |            |         |           |           |           |           |
| Field crop                   | No.  | 4,697      | 135        | 341       | 501       | 2,540     | 759       | 39        | 181        | 15      | 143       | 9         | 34        | 0         |
| Vegetable                    | No.  | 1,633      | 30         | 9         | 283       | 10        | 72        | 14        | 194        | 42      | 657       | 39        | 283       | 0         |
| Fruit & nut                  | No.  | 7,891      | 102        | 1,817     | 1,986     | 15        | 197       | 65        | 553        | 168     | 2,062     | 357       | 569       | 0         |
| Poultry                      | No.  | 1,893      | 132        | 29        | 44        | 83        | 58        | 28        | 69         | 209     | 584       | 117       | 539       | 1         |
| Dairy                        | No.  | 11,164     | 726        | 289       | 278       | 1,909     | 2,361     | 119       | 216        | 675     | 966       | 1,144     | 2,473     | 8         |
| Livestock                    | No.  | 18,288     | 2,446      | 1,420     | 1,021     | 2,557     | 2,351     | 1,460     | 1,499      | 773     | 1,712     | 1,399     | 1,301     | 349       |
| General                      | No.  | 10,612     | 713        | 1,334     | 609       | 2,509     | 1,616     | 490       | 641        | 189     | 1,975     | 229       | 240       | 67        |
| Miscellaneous                | No.  | 50,528     | 4,899      | 2,304     | 2,432     | 2,630     | 2,773     | 1,897     | 2,358      | 5,127   | 11,691    | 5,220     | 9,033     | 164       |
| Farms by economic class:     |      |            |            |           |           |           |           |           |            |         |           |           |           |           |
| Commercial                   | No.  | 71,408     | 5,731      | 7,610     | 5,152     | 11,663    | 7,764     | 5,310     | 5,073      | 2,463   | 9,817     | 3,858     | 6,499     | 468       |
| Class 1                      | No.  | 7,825      | 316        | 1,017     | 790       | 1,277     | 731       | 789       | 885        | 150     | 1,008     | 184       | 620       | 58        |
| Class 2                      | No.  | 11,576     | 657        | 1,743     | 882       | 2,052     | 1,027     | 1,257     | 1,004      | 232     | 1,292     | 400       | 939       | 91        |
| Class 3                      | No.  | 15,607     | 1,088      | 1,868     | 1,039     | 3,249     | 1,900     | 1,191     | 1,097      | 386     | 1,606     | 684       | 1,395     | 104       |
| Class 4                      | No.  | 14,339     | 1,259      | 1,387     | 982       | 2,732     | 1,935     | 967       | 870        | 405     | 1,879     | 714       | 1,099     | 110       |
| Class 5                      | No.  | 13,093     | 1,379      | 1,054     | 984       | 1,808     | 1,582     | 701       | 765        | 569     | 2,231     | 874       | 1,080     | 66        |
| Class 6                      | No.  | 8,968      | 1,032      | 541       | 475       | 545       | 589       | 405       | 452        | 721     | 1,801     | 1,002     | 1,366     | 39        |
| Other                        | No.  | 46,040     | 4,472      | 2,120     | 2,274     | 2,477     | 2,628     | 1,744     | 2,216      | 4,741   | 10,549    | 4,676     | 7,989     | 154       |
| Farms by tenure of operator: |      |            |            |           |           |           |           |           |            |         |           |           |           |           |
| Full owners                  | No.  | 79,859     | 6,861      | 5,619     | 5,335     | 7,965     | 6,552     | 3,416     | 4,241      | 5,811   | 15,636    | 7,003     | 11,058    | 362       |
| Part owners                  | No.  | 26,225     | 2,602      | 2,963     | 1,444     | 3,947     | 2,481     | 2,501     | 2,159      | 1,048   | 3,468     | 1,015     | 2,407     | 190       |
| Managers                     | No.  | 796        | 52         | 83        | 96        | 163       | 88        | 67        | 64         | 8       | 76        | 39        | 48        | 12        |
| All tenants                  | No.  | 10,568     | 688        | 1,065     | 551       | 2,065     | 1,271     | 1,070     | 825        | 337     | 1,186     | 477       | 975       | 58        |

Source: 1964 Census of Agriculture.

in those subregions west of the Cascades is associated with population growth and industrial expansion, which has been considerably greater in the western part of the region. In those subregions east of the Cascades, resource developments (such as irrigation) and other factors have caused acreages of land in farms to either increase or, at least, to be restricted in their rate of decline. Also, they have caused the rate of decline in the number of farms to be less than that in the western part of the region. The number of farms has been decreasing as the average size of farm has been increasing. This has been associated with the necessity of reducing costs per unit of production by the use of advanced technologies, coupled with a declining return per unit of output. Also, it allows farm enterprises to take greater advantage of economies in size of operation and maintain or increase total net income.

The classification of farms by type are those used in the Census of Agriculture, which is based on a description of the major source of income from farm sales. Thus, dairy farms are defined as farms with 50 percent or more of the total value of farm sales from dairy products. Miscellaneous and general farms are those receiving their income from three or more sources and do not meet the criteria for any other type.

Over half of the farms in the region are classified as general and miscellaneous. These farms are most numerous in the subregions west of the Cascades, where the farm enterprises are most diversified. Dairy farms are generally concentrated in southern Idaho and in the subregions west of the Cascades. Livestock farms are well distributed throughout all subregions. Vegetable and poultry farms in the region are relatively small in number, but they are concentrated in Subregions 3, 9, and 11. Over half of the field crop farms are located in Subregion 4.

About 60 percent of the farms are commercial farms. In general, all farms were classified as commercial if the value of sales amounted to \$2,500 or more, or if the operator was under 65 years of age and did not work off the farm more than 100 days, or has nonfarm income greater than farm income. Noncommercial (other) farms are those farms with less than \$2,500 annual sales, where the operator works off the farm more than 100 days, or has nonfarm income greater than farm income. These are generally part-time farms or farms on which the operator is retired. These noncommercial farms comprise about 40 percent of all farms in the region, and over 50 percent of all farms in Subregions 8, 9, 10, and 11.

Over two-thirds of the farms in the region are owner operated; part-owners operated 22 percent, and tenants operated 10 percent of all farm enterprises. The employment of farm managers



accounted for less than 1 percent of all farm operations. These farm tenure relationships were somewhat similar throughout the subregions.

#### AGRICULTURAL PRODUCTION

In 1964 the value of agricultural commodities produced in the region exceeded \$1.5 billion. About 60 percent of the value was from crop production and 40 percent from the production of livestock and livestock products and poultry and poultry products. Many of the products grown are important in both national and international markets. An additional \$2.1 million of farm income was derived from providing hunting, fishing, and other recreational services.

Tables 25, 26, and 27 present the volume and value of major agricultural commodities produced in the region and subregions. Other studies have presented comprehensive and detailed historical and current descriptive analyses of the geographical location and quantities of production of agricultural commodities produced in the Pacific Northwest (29) (46) (47) (48) (49) (50) (69). Consequently, only a brief description is presented in this report.

Small grains (barley, corn, oats, rye, and wheat) are produced throughout the region. Wheat is the major cereal and its production is concentrated in the Columbia Basin area and southeastern Idaho. Oat production is not concentrated in any one part of the region; however, the Willamette Subregion is the heaviest single production area. Barley production is concentrated in the same areas as wheat production, the Columbia Basin area and southeastern Idaho. The most important corn growing areas are located in Subregions 2, 3, 5, and 9. The production of small grains was over 6 million tons in the region in 1964 and its value over \$322 million. Small grains are the major source of agricultural income. Subregions 2, 4, 6, and 7 are the major production areas.

Hay production is another major commodity produced and source of agricultural income. Production of hay is not centralized in any subregion, but significant quantities are produced in Subregions 1, 2, 4, and 5. The region produced 7.7 million tons of hay in 1964, valued at over \$166 million.

Other major crops grown, in terms of value, are fruits, nuts, and berries. The value of these crops was over \$152 million in the region in 1964. A large variety of deciduous tree fruits, berries, and nuts are grown in relatively concentrated areas. Important crops grown are apples, pears, cherries, strawberries, raspberries, walnuts, and filberts. The production



Table 25 - Production of Agricultural Commodities, Columbia-North Pacific Region and Subregions, 1964 <sup>1/</sup>

| Commodity              | Unit | C-NP      | SUB REGION |         |          |          |          |          |          |       |           |         |         |       |
|------------------------|------|-----------|------------|---------|----------|----------|----------|----------|----------|-------|-----------|---------|---------|-------|
|                        |      |           | 1          | 2       | 3        | 4        | 5        | 6        | 7        | 8     | 9         | 10      | 11      | 12    |
| (Thousands)            |      |           |            |         |          |          |          |          |          |       |           |         |         |       |
| Crops:                 |      |           |            |         |          |          |          |          |          |       |           |         |         |       |
| Small Grains 2/        | Tons | 6,096.4   | 435.8      | 1,307.6 | 184.8    | 927.0    | 205.1    | 1,524.5  | 1,175.3  | 8.6   | 288.8     | 8.5     | 10.8    | 19.6  |
| All Hay                | Tons | 7,747.3   | 843.9      | 962.9   | 324.8    | 2,034.8  | 1,143.7  | 536.6    | 563.9    | 183.8 | 382.9     | 200.7   | 294.4   | 274.9 |
| Dry Beans & Peas       | Cwt. | 6,833.6   | 669.4      | 795.0   | 9.7      | 1,929.4  | 112.2    | 3,099.2  | 193.4    | t     | 2.5       | .8      | 11.9    | 0.0   |
| Sugar Beets            | Tons | 4,587.7   | 57.1       | 708.5   | 563.8    | 1,740.6  | 1,448.5  | 1.4      | 66.6     | 0.0   | 1.2       | 0.0     | 0.0     | 0.0   |
| Potatoes               | Cwt. | 55,419.1  | 749.8      | 8,753.4 | 1,245.6  | 32,313.4 | 7,648.5  | 383.8    | 2,776.9  | 143.2 | 580.7     | 30.7    | 792.9   | .2    |
| Vegetables             | Cwt. | 20,464.1  | 90.8       | 798.4   | 2,007.4  | 594.0    | 3,805.9  | 389.3    | 2,766.2  | 283.5 | 7,384.4   | 120.2   | 2,253.9 | t     |
| Fruit, Nuts & Berries  | Tons | 1,258.3   | 5.1        | 404.5   | 460.9    | 1.7      | 53.5     | 4.8      | 100.6    | 10.2  | 106.5     | 81.6    | 28.9    | t     |
| Miscellaneous Crops 3/ | lbs. | 407,221.9 | 941.8      | 4,705.7 | 41,747.2 | 4,971.4  | 26,105.5 | 72,281.5 | 15,953.3 | 227.7 | 238,653.7 | 1,606.4 | 27.8    | 0.0   |
| (Millions)             |      |           |            |         |          |          |          |          |          |       |           |         |         |       |
| Livestock & Livestock  |      |           |            |         |          |          |          |          |          |       |           |         |         |       |
| Products:              |      |           |            |         |          |          |          |          |          |       |           |         |         |       |
| Beef & Veal            | lbs. | 1,427.7   | 131.6      | 117.7   | 84.9     | 236.2    | 237.6    | 118.5    | 151.4    | 45.4  | 81.0      | 66.8    | 98.0    | 58.6  |
| Pork                   | lbs. | 141.6     | 16.3       | 12.4    | 6.0      | 20.0     | 15.3     | 22.9     | 13.9     | 2.1   | 24.5      | 2.8     | 5.2     | .2    |
| Lamb & Mutton          | lbs. | 132.4     | 3.3        | 4.0     | 5.4      | 55.9     | 14.2     | 8.2      | 8.7      | .9    | 17.4      | 11.5    | 1.1     | 1.8   |
| Milk                   | lbs. | 4,549.9   | 220.3      | 116.1   | 126.8    | 842.8    | 691.1    | 47.5     | 89.5     | 271.4 | 418.7     | 458.5   | 1,264.9 | 2.3   |
| Broilers               | lbs. | 124.3     | .2         | 0.0     | 1.8      | 8.6      | 10.0     | 3.0      | 4.0      | 15.6  | 29.1      | 3.7     | 48.3    | 0.0   |
| Turkeys                | lbs. | 41.0      | t          | .2      | 4.2      | t        | 2.7      | .1       | 2.7      | 1.3   | 24.7      | 2.8     | 2.1     | t     |
| Farm Chickens          | lbs. | 30.4      | 3.2        | .4      | .7       | 1.3      | 1.1      | .5       | .7       | 3.1   | 7.1       | 1.2     | 11.1    | .1    |
| Eggs                   | lbs. | 231.4     | 24.1       | 2.6     | 5.3      | 9.9      | 8.4      | 3.7      | 5.7      | 23.9  | 54.1      | 8.9     | 84.8    | t     |

<sup>1/</sup> Estimated from Census of Agriculture and Statistical Reporting Service data.

<sup>2/</sup> Small grains include barley, corn, oats, rye, and wheat.

<sup>3/</sup> Miscellaneous crops include forage seeds, hops, and mint.

t = trace

Table 26 - Value of Production of Agricultural Commodities, Columbia-North Pacific Region and Subregions, 1964 <sup>1/</sup>

| Commodity                         | C-NP      | SUBREGIONS      |          |          |          |          |          |          |          |          |          |          |          |
|-----------------------------------|-----------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                                   |           | 1               | 2        | 3        | 4        | 5        | 6        | 7        | 8        | 9        | 10       | 11       | 12       |
|                                   |           | (1,000 Dollars) |          |          |          |          |          |          |          |          |          |          |          |
| Major Crops:                      |           |                 |          |          |          |          |          |          |          |          |          |          |          |
| Small Grains <sup>2/</sup>        | 322,219.4 | 22,689.7        | 70,824.6 | 9,592.2  | 48,068.8 | 10,074.2 | 81,672.3 | 62,724.4 | 384.7    | 14,364.8 | 365.3    | 509.8    | 948.6    |
| All Hay                           | 166,567.0 | 18,143.8        | 20,702.4 | 6,983.2  | 43,748.2 | 24,589.6 | 11,536.9 | 12,123.8 | 3,951.7  | 8,232.4  | 4,315.0  | 6,329.6  | 5,910.4  |
| Dry Beans & Peas                  | 34,276.4  | 2,758.8         | 4,439.5  | 57.8     | 12,810.2 | 790.8    | 12,573.0 | 784.5    | 0.0      | 10.1     | 3.2      | 48.5     | 0.0      |
| Sugar Beets                       | 52,758.6  | 656.6           | 8,147.8  | 6,483.7  | 20,016.9 | 16,657.8 | 16.1     | 765.9    | 0.0      | 13.8     | 0.0      | 0.0      | 0.0      |
| Potatoes                          | 75,601.6  | 1,004.7         | 11,729.6 | 1,669.1  | 44,640.0 | 10,249.0 | 514.3    | 3,721.0  | 191.9    | 778.1    | 41.1     | 1,062.5  | .3       |
| Vegetables                        | 60,778.1  | 269.7           | 2,371.2  | 5,962.0  | 1,764.2  | 11,303.5 | 1,156.2  | 8,126.5  | 842.0    | 21,931.7 | 357.0    | 6,694.1  | t        |
| Fruits, Nuts & Berries            | 152,024.4 | 542.6           | 40,935.4 | 46,638.5 | 186.7    | 5,442.6  | 523.2    | 10,454.4 | 2,405.9  | 26,860.4 | 9,443.6  | 8,591.1  | t        |
| Miscellaneous Crops <sup>3/</sup> | 84,639.6  | 150.7           | 1,788.2  | 22,126.0 | 745.7    | 6,004.3  | 10,842.2 | 3,828.8  | 334.7    | 38,184.6 | 514.0    | 120.4    | 0.0      |
| Livestock & Livestock Products:   |           |                 |          |          |          |          |          |          |          |          |          |          |          |
| Beef & Veal                       | 283,826.8 | 26,162.1        | 23,398.8 | 16,878.1 | 46,956.6 | 47,234.9 | 23,557.8 | 30,098.3 | 9,025.5  | 16,102.8 | 13,279.8 | 19,482.4 | 11,649.7 |
| Pork                              | 22,882.6  | 2,634.1         | 2,003.8  | 969.6    | 3,232.0  | 2,472.5  | 3,700.6  | 2,246.2  | 339.4    | 3,959.2  | 452.5    | 840.3    | 32.3     |
| Lamb & Mutton                     | 21,726.8  | 541.5           | 656.4    | 886.1    | 9,173.2  | 2,330.2  | 1,845.6  | 1,427.7  | 147.7    | 2,855.3  | 1,887.2  | 180.5    | 295.4    |
| Milk                              | 198,375.6 | 9,605.1         | 5,062.0  | 5,528.5  | 36,746.1 | 30,132.0 | 2,071.0  | 3,902.2  | 11,833.0 | 18,255.3 | 19,990.6 | 55,149.6 | 100.3    |
| Broilers                          | 21,131.0  | 34.0            | 0.0      | 306.0    | 1,462.0  | 1,700.0  | 510.0    | 680.0    | 2,652.0  | 4,947.0  | 629.0    | 8,211.0  | 0.0      |
| Turkey                            | 8,841.4   | t               | 43.3     | 910.1    | t        | 585.1    | 21.7     | 585.1    | 281.7    | 5,352.5  | 606.8    | 455.1    | t        |
| Farm Chickens                     | 2,187.0   | 229.4           | 28.7     | 50.2     | 93.2     | 78.9     | 35.9     | 50.2     | 222.3    | 509.1    | 86.0     | 795.9    | 7.2      |
| Eggs                              | 50,537.8  | 5,263.4         | 567.8    | 1,157.5  | 2,162.2  | 1,834.6  | 808.1    | 1,244.9  | 5,219.8  | 11,815.4 | 1,943.8  | 18,520.3 | t        |

<sup>1/</sup> Values based on normalized prices and Statistical Reporting Service data.<sup>2/</sup> Small grains include barley, corn, oats, rye, and wheat.<sup>3/</sup> Miscellaneous crops include forage seeds, hops and mint.

t = trace

Table 27 - Value of Production of Major Agricultural Commodity Groups, Columbia-North Pacific Region and Subregions, 1964 <sup>1/</sup>

| Commodity Groups 2/   | C-NP        | 1        | 2         | 3         | 4         | 5         | S U B R E G I O N S |           |          |           |          |           | 10       | 11 | 12 |
|-----------------------|-------------|----------|-----------|-----------|-----------|-----------|---------------------|-----------|----------|-----------|----------|-----------|----------|----|----|
|                       |             |          |           |           |           |           | 6                   | 7         | 8        | 9         |          |           |          |    |    |
|                       |             |          |           |           |           |           |                     |           |          |           |          |           |          |    |    |
| (1,000 Dollars)       |             |          |           |           |           |           |                     |           |          |           |          |           |          |    |    |
| Total Value           | 1,558,374.1 | 90,686.2 | 192,699.5 | 126,198.6 | 271,806.0 | 171,480.0 | 150,884.9           | 142,763.9 | 37,832.3 | 174,172.5 | 53,914.9 | 126,991.1 | 18,944.2 |    |    |
| Total Value-Crops     | 948,865.1   | 46,216.6 | 160,938.7 | 99,512.5  | 171,980.7 | 85,111.8  | 118,834.2           | 102,529.3 | 8,110.9  | 110,375.9 | 15,039.2 | 23,356.0  | 6,859.3  |    |    |
| Field Crops           | 523,062.8   | 43,592.3 | 95,966.5  | 16,633.2  | 104,627.2 | 35,454.6  | 105,782.2           | 75,632.7  | 4,336.4  | 22,607.3  | 4,683.5  | 6,887.9   | 6,859.0  |    |    |
| Other                 | 425,802.3   | 2,624.3  | 64,972.2  | 82,879.3  | 67,353.5  | 49,657.2  | 13,052.0            | 26,896.6  | 3,774.5  | 87,768.6  | 10,355.7 | 16,468.1  | .3       |    |    |
| Total Value-Livestock | 609,509.0   | 44,469.6 | 31,760.8  | 26,686.1  | 99,825.3  | 86,368.2  | 32,050.7            | 40,234.6  | 29,721.4 | 63,796.6  | 38,875.7 | 103,635.1 | 12,084.9 |    |    |
| Livestock & Products  | 526,811.8   | 38,942.8 | 31,121.0  | 24,262.3  | 96,107.9  | 82,169.6  | 30,675.0            | 37,674.4  | 21,345.6 | 41,172.6  | 35,610.1 | 75,652.8  | 12,077.7 |    |    |
| Poultry & Products    | 82,797.2    | 5,526.8  | 639.8     | 2,423.8   | 3,717.4   | 4,198.6   | 1,375.7             | 2,560.2   | 8,375.8  | 22,624.0  | 3,265.6  | 27,982.3  | 7.2      |    |    |

<sup>1/</sup> Production estimated from Census of Agriculture and Statistical Reporting Service data. Values based on normalized prices and Statistical Reporting Service data.

<sup>2/</sup> Items included in each commodity group are as follows: Field crops = small grains, hay, dry beans and peas  
 Other crops = sugar beets, potatoes, vegetables, fruits, nuts, berries, and miscellaneous crops  
 Livestock & products = beef and veal, pork, lamb and mutton, and milk  
 Poultry & products = broilers, turkeys, farm chickens, and eggs.

of these commodities are concentrated in Subregions 2, 3, 7, and 9.

Potatoes and sugar beets are also major crops. They are generally grown on the irrigated lands in Subregions 2, 3, 4, and 5. Potato production amounted to 55 million hundredweight in the region in 1964 and its value was over \$75 million. Sugar beet production was over four and a half million tons and its value about \$53 million.

Miscellaneous crops (hops, mint, and forage seeds) are grown principally in Subregion 9, but Subregions 3, 5, and 6 are also important. Hops and mint are grown mainly in the Yakima and Willamette Subregions. The production of grass and cover-crop seeds is most heavily concentrated in the Willamette Subregion, with secondary concentration in Subregions 5 and 6. The value of production of these crops was about \$85 million in 1964.

Dry beans and peas are grown primarily in Subregions 4 and 6. Dry field peas are produced in a concentrated area in southeastern Washington and the adjacent portion of Idaho north of the Snake River. Production of dry field peas is centered in the Twin Falls area of southern Idaho (Subregion 4), and the Columbia Basin project area (Subregion 2). In 1964, about 6.8 million hundredweight of dry beans and peas were produced and their value exceeded \$34 million.

The production of livestock and livestock products and poultry and poultry products is an important segment of the agricultural economy of the region. The total value of this production exceeded \$600 million in 1964. Livestock and livestock products accounted for \$527 million, and poultry and poultry products, \$83 million.

The production of cattle and calves (beef and veal) is distributed throughout the region. Beef cattle operations fall into three categories; (1) range cattle ranching, (2) farm beef production, and (3) cattle finishing or feedlot enterprises. Cattle ranching is generally a large scale enterprise, usually located in subregions east of the Cascades. Farm beef production is generally combined with other farm enterprises throughout the region and feedlot enterprises are commonly found in irrigated areas such as by the Snake River and in the Yakima Valley. Beef and veal production in the region was over 1.4 billion pounds in 1964 and its value about \$284 million.

Milk is a major livestock product. The production of

milk is concentrated in those areas of the region where population is located (mainly west of the Cascades, and also in Subregions 4 and 5). Over 4.5 billion pounds of milk was produced in 1964. The value of milk production was about \$198 million.

The production of lamb and mutton and pork in 1964 was 132 and 142 million pounds, respectively. The production of these commodities occurred throughout the region. Subregions 4, 6, and 9 were the most important in the production of pork and lamb and mutton.

The production of poultry and poultry products is concentrated in those subregions west of the Cascades. Eggs and broilers are the most important products, but turkeys and farm chickens are significant in some subregions. The total value of output from poultry and poultry products in 1964 was about \$83 million. The value of egg production was about \$51 million, and broilers, \$21 million.

The projected future levels of agricultural production for the region and subregions relies heavily upon the National-Regional Program of Economic Analysis and Projections of the Economic Research Service for the Water Resources Council (64). The national program provided estimates of requirements for food and fiber for the United States. These estimates were essential because many of the agricultural commodities produced in the region are exported to national and international markets, as well as being consumed within the region. Also, regional projections of agricultural production were made for these same commodities by the national program.

Certain assumptions relating to the future economy and its structure were made in the national program. These assumptions of basic economic indicators provided the framework within which the projections were developed and are common to all sections of this report. The agricultural projections consider, implicitly or explicitly, important factors which will shape the growth and development in agriculture. Several important factors that affect the future agricultural economy were explicitly considered in developing the national projections of food and fiber. These are as follows:

- (1) Population growth;
- (2) Rising per capita income, changes in consumer tastes and their influence on per capita use of agricultural commodities;
- (3) Industrial and other uses of agricultural commodities;



(4) Livestock feeding efficiencies and composition of the feed ration; and

(5) The foreign market for agricultural products.

The national projections of production requirements, presented in table 28, represent an agricultural economy where agricultural production is in balance with estimated future demand. A detailed discussion of the assumptions and procedures used in the national program is reported in several other studies (64)(67).

In developing the regional projections, primary emphasis was placed on the examination and extrapolation of past trends in production patterns in the region relative to the nation. These historical relationships were projected to 1980, with only minor modifications beyond that period. For those commodities for which national projections were not developed (such as berries, hops, mints, forage seeds), the major factors considered in developing the projections were historical trends in production and national population growth. In general, the historical production patterns indicated an increasing relative share of national production. This is reflected in the regional projections up to the year 1980. The procedures used for developing the subregional projections were similar to those used for the region. The major factors considered were historical production in each subregion relative to the region, production trends, population growth and, to the extent possible, the availability of resources for agricultural production.

The projected values and volumes of production of major crops and livestock commodities for the Columbia-North Pacific Region and the 12 subregions are presented in tables 29 and 30. The value (in constant dollars) and volume of all agricultural commodities is projected to increase about two and a half times by 2020. The production of all crops will increase by 160 percent and all livestock by 131 percent. By 2020 the value of all crops produced will represent about 64 percent of the total value of production, and livestock and poultry, 36 percent. The major increases will be in those commodities such as sugar beets, potatoes, vegetables, fruits, nuts and berries, beef and veal, eggs and broilers. These regional projections reflect the changing national requirements for food and fiber. The projected increases of agricultural production vary between the subregions, ranging from an increase of over 200 percent in Subregion 2 to less than 100 percent in other subregions, such as 10 and 12.

Table 28 - Production Requirements for Agricultural Commodities,  
United States, 1959-61, with Projections to 1980, 2000 and 2020 <sup>1/</sup>

| Commodity                 | Unit | 1959-61     |             |             | 1980        |             |             | 2000        |             |             | 2020        |             |             |
|---------------------------|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                           |      | (Thousands) |             |             | (Thousands) |             |             | (Thousands) |             |             | (Thousands) |             |             |
| Feed grains (corn equiv.) | Tons | 145,128     | 197,200     | 244,100     | 197,200     | 244,100     | 298,700     | 197,200     | 244,100     | 298,700     | 197,200     | 244,100     | 298,700     |
| Corn                      | do.  | 106,010     | 141,500     | 178,400     | 141,500     | 178,400     | 222,400     | 141,500     | 178,400     | 222,400     | 141,500     | 178,400     | 222,400     |
| Oats                      | do.  | 17,167      | 17,800      | 15,800      | 17,800      | 15,800      | 11,000      | 17,800      | 15,800      | 11,000      | 17,800      | 15,800      | 11,000      |
| Barley                    | do.  | 9,995       | 12,300      | 12,200      | 12,300      | 12,200      | 11,000      | 12,300      | 12,200      | 11,000      | 12,300      | 12,200      | 11,000      |
| Sorghum                   | do.  | 15,445      | 25,600      | 37,700      | 25,600      | 37,700      | 54,300      | 25,600      | 37,700      | 54,300      | 25,600      | 37,700      | 54,300      |
| Food crops                |      |             |             |             |             |             |             |             |             |             |             |             |             |
| Wheat                     | Bu.  | 1,237,700   | 1,873,600   | 2,127,500   | 1,873,600   | 2,127,500   | 2,458,600   | 1,873,600   | 2,127,500   | 2,458,600   | 1,873,600   | 2,127,500   | 2,458,600   |
| Rye                       | do.  | 27,868      | 41,400      | 54,100      | 41,400      | 54,100      | 71,800      | 41,400      | 54,100      | 71,800      | 41,400      | 54,100      | 71,800      |
| Rice (rough)              | Cwt. | 54,154      | 83,300      | 93,600      | 83,300      | 93,600      | 107,000     | 83,300      | 93,600      | 107,000     | 83,300      | 93,600      | 107,000     |
| Flaxseed                  | Bu.  | 24,605      | 21,800      | 27,000      | 21,800      | 27,000      | 33,500      | 21,800      | 27,000      | 33,500      | 21,800      | 27,000      | 33,500      |
| Soybeans                  | do.  | 589,257     | 1,268,900   | 1,531,900   | 1,268,900   | 1,531,900   | 1,860,900   | 1,268,900   | 1,531,900   | 1,860,900   | 1,268,900   | 1,531,900   | 1,860,900   |
| Peanuts (farm stock)      | Lbs. | 1,705,500   | 2,428,000   | 3,179,000   | 2,428,000   | 3,179,000   | 4,133,000   | 2,428,000   | 3,179,000   | 4,133,000   | 2,428,000   | 3,179,000   | 4,133,000   |
| Sugar                     | Tons | 3,290       | 7,300       | 11,400      | 7,300       | 11,400      | 16,500      | 7,300       | 11,400      | 16,500      | 7,300       | 11,400      | 16,500      |
| Dry beans                 | Cwt. | 19,048      | 22,900      | 28,900      | 22,900      | 28,900      | 36,600      | 22,900      | 28,900      | 36,600      | 22,900      | 28,900      | 36,600      |
| Dry peas                  | do.  | 3,927       | 5,300       | 6,100       | 5,300       | 6,100       | 7,200       | 5,300       | 6,100       | 7,200       | 5,300       | 6,100       | 7,200       |
| Potatoes                  | do.  | 265,609     | 319,100     | 420,600     | 319,100     | 420,600     | 551,200     | 319,100     | 420,600     | 551,200     | 319,100     | 420,600     | 551,200     |
| Sweet potatoes            | do.  | 16,508      | 17,500      | 23,200      | 17,500      | 23,200      | 30,600      | 17,500      | 23,200      | 30,600      | 17,500      | 23,200      | 30,600      |
| Fruits and Vegetables     |      |             |             |             |             |             |             |             |             |             |             |             |             |
| Citrus fruits             | Tons | 8,028       | 11,000      | 14,100      | 11,000      | 14,100      | 17,900      | 11,000      | 14,100      | 17,900      | 11,000      | 14,100      | 17,900      |
| Noncitrus fruits          | do.  | 9,952       | 12,600      | 17,200      | 12,600      | 17,200      | 22,900      | 12,600      | 17,200      | 22,900      | 12,600      | 17,200      | 22,900      |
| Vegetables                | Cwt. | 403,902     | 615,900     | 801,800     | 615,900     | 801,800     | 1,034,600   | 615,900     | 801,800     | 1,034,600   | 615,900     | 801,800     | 1,034,600   |
| Tree nuts (shelled)       | Lbs. | 170,000     | 147,700     | 275,700     | 147,700     | 275,700     | 436,000     | 147,700     | 275,700     | 436,000     | 147,700     | 275,700     | 436,000     |
| Fiber crops               |      |             |             |             |             |             |             |             |             |             |             |             |             |
| Cotton                    | Lbs. | 7,191,300   | 8,083,000   | 9,405,000   | 8,083,000   | 9,405,000   | 11,064,000  | 8,083,000   | 9,405,000   | 11,064,000  | 8,083,000   | 9,405,000   | 11,064,000  |
| Tobacco                   | do.  | 1,934,200   | 2,134,000   | 2,668,000   | 2,134,000   | 2,668,000   | 3,337,000   | 2,134,000   | 2,668,000   | 3,337,000   | 2,134,000   | 2,668,000   | 3,337,000   |
| Livestock and products    |      |             |             |             |             |             |             |             |             |             |             |             |             |
| Beef and veal             | Lbs. | 28,898,500  | 45,506,000  | 60,588,000  | 45,506,000  | 60,588,000  | 79,506,000  | 45,506,000  | 60,588,000  | 79,506,000  | 45,506,000  | 60,588,000  | 79,506,000  |
| Pork                      | do.  | 20,220,000  | 25,947,000  | 33,990,000  | 25,947,000  | 33,990,000  | 44,056,000  | 25,947,000  | 33,990,000  | 44,056,000  | 25,947,000  | 33,990,000  | 44,056,000  |
| Lamb and mutton           | do.  | 1,683,000   | 1,630,000   | 2,164,000   | 1,630,000   | 2,164,000   | 2,831,000   | 1,630,000   | 2,164,000   | 2,831,000   | 1,630,000   | 2,164,000   | 2,831,000   |
| Farm chickens             | do.  | 1,251,700   | 1,396,000   | 1,824,000   | 1,396,000   | 1,824,000   | 2,362,000   | 1,396,000   | 1,824,000   | 2,362,000   | 1,396,000   | 1,824,000   | 2,362,000   |
| Turkeys                   | do.  | 1,600,900   | 3,413,000   | 4,448,000   | 3,413,000   | 4,448,000   | 5,746,000   | 3,413,000   | 4,448,000   | 5,746,000   | 3,413,000   | 4,448,000   | 5,746,000   |
| Eggs                      | No.  | 62,302,000  | 72,613,000  | 95,251,000  | 72,613,000  | 95,251,000  | 123,886,000 | 72,613,000  | 95,251,000  | 123,886,000 | 72,613,000  | 95,251,000  | 123,886,000 |
| Milk                      | Lbs. | 123,460,700 | 139,372,000 | 181,490,000 | 139,372,000 | 181,490,000 | 234,226,000 | 139,372,000 | 181,490,000 | 234,226,000 | 139,372,000 | 181,490,000 | 234,226,000 |
| Broilers                  | do.  | 6,207,100   | 10,263,000  | 13,293,000  | 10,263,000  | 13,293,000  | 17,094,000  | 10,263,000  | 13,293,000  | 17,094,000  | 10,263,000  | 13,293,000  | 17,094,000  |

<sup>1/</sup> Projections based on Series C population estimates.

Table 29 - Value of Production of Major Agricultural Commodity Groups, Columbia-North Pacific Region, 1964, with Projections to 1980, 2000, and 2020 <sup>1/</sup>

| Commodity Groups <sup>2/</sup>  | 1964            | 1980        | 2000        | 2020        |
|---------------------------------|-----------------|-------------|-------------|-------------|
|                                 | (1,000 Dollars) |             |             |             |
| Total Value                     | 1,558,374.1     | 2,364,107.3 | 3,028,301.7 | 3,878,579.6 |
| Total Value Crops               | 948,865.1       | 1,543,964.7 | 1,947,278.5 | 2,470,093.4 |
| Field Crops                     | 523,062.8       | 811,688.2   | 948,215.5   | 1,137,929.8 |
| Other                           | 425,802.3       | 732,276.5   | 999,063.0   | 1,332,163.6 |
| Total Value Livestock & Poultry | 609,509.0       | 820,142.6   | 1,081,023.2 | 1,408,486.4 |
| Livestock & Products            | 526,811.8       | 794,856.0   | 930,470.4   | 1,213,464.6 |
| Poultry & Products              | 82,697.2        | 115,286.6   | 150,552.8   | 195,121.6   |

<sup>1/</sup> Production estimated from Census of Agriculture and Statistical Reporting Service data. Values based on normalized prices and Statistical Reporting Service data.

<sup>2/</sup> Items included in each commodity group are as follows:

Field crops = small grains, hay, dry beans and peas

Other crops = sugar beets, potatoes, vegetables, fruits, nuts, berries, and miscellaneous crops

Livestock & products = beef and veal, pork, lamb and mutton, and milk

Poultry & products = broilers, turkeys, farm chickens, and eggs.

Table 30 - Projections of Production of Major Agricultural Commodity Groups,  
1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregion | Commodity Groups <sup>1/</sup> | Projections <sup>2/</sup><br>Index Numbers 1964=100 |      |      |
|-----------|--------------------------------|---|------|------|
|           |                                | 1980  | 2000 | 2020 |
| 1         | All Crops, Livestock & Poultry | 145   | 180  | 226  |
|           | All Crops                      | 161   | 190  | 231  |
|           | Field Crops                    | 164   | 193  | 233  |
|           | Other                          | 116   | 155  | 203  |
|           | All Livestock & Poultry        | 127   | 168  | 220  |
|           | Livestock & Products           | 125   | 166  | 216  |
|           | Poultry & Products             | 144   | 189  | 245  |
| 2         | All Crops, Livestock & Poultry | 193   | 246  | 315  |
|           | All Crops                      | 198   | 250  | 319  |
|           | Field Crops                    | 185   | 216  | 260  |
|           | Other                          | 217   | 301  | 406  |
|           | All Livestock & Poultry        | 171   | 226  | 295  |
|           | Livestock & Products           | 172   | 228  | 298  |
|           | Poultry & Products             | 103   | 136  | 175  |
| 3         | All Crops, Livestock & Poultry | 149   | 199  | 255  |
|           | All Crops                      | 150   | 201  | 257  |
|           | Field Crops                    | 168   | 204  | 205  |
|           | Other                          | 147   | 200  | 267  |
|           | All Livestock & Poultry        | 144   | 190  | 249  |
|           | Livestock & Products           | 146   | 193  | 253  |
|           | Poultry & Products             | 125   | 164  | 213  |
| 4         | All Crops, Livestock & Poultry | 161   | 207  | 268  |
|           | All Crops                      | 167   | 213  | 275  |
|           | Field Crops                    | 155   | 183  | 228  |
|           | Other                          | 187   | 259  | 349  |
|           | All Livestock & Poultry        | 149   | 197  | 256  |
|           | Livestock & Products           | 149   | 196  | 256  |
|           | Poultry & Products             | 162   | 211  | 273  |
| 5         | All Crops, Livestock & Poultry | 168   | 219  | 285  |
|           | All Crops                      | 194   | 252  | 326  |
|           | Field Crops                    | 211   | 249  | 298  |
|           | Other                          | 182   | 255  | 347  |
|           | All Livestock & Poultry        | 142   | 187  | 244  |
|           | Livestock & Products           | 140   | 185  | 241  |
|           | Poultry & Products             | 174   | 227  | 293  |
| 6         | All Crops, Livestock & Poultry | 129   | 153  | 182  |
|           | All Crops                      | 130   | 149  | 171  |
|           | Field Crops                    | 129   | 146  | 164  |
|           | Other                          | 136   | 178  | 231  |
|           | All Livestock & Poultry        | 127   | 168  | 220  |
|           | Livestock & Products           | 128   | 169  | 221  |
|           | Poultry & Products             | 109   | 142  | 183  |
| 7         | All Crops, Livestock & Poultry | 143   | 178  | 230  |
|           | All Crops                      | 146   | 177  | 227  |
|           | Field Crops                    | 140   | 162  | 205  |
|           | Other                          | 163   | 218  | 287  |
|           | All Livestock & Poultry        | 137   | 181  | 237  |
|           | Livestock & Products           | 140   | 185  | 242  |
|           | Poultry & Products             | 96  | 126  | 163  |

Continued

Table 30 - Projections of Production of Major Agricultural Commodity Groups, 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions--Con.

| Subregion | Commodity Groups <sup>1/</sup> | Projections <sup>2/</sup><br>Index Numbers 1964=100 |      |      |
|-----------|--------------------------------|---|------|------|
|           |                                | 1980  | 2000 | 2020 |
| 8         | All Crops, Livestock & Poultry | 125   | 162  | 210  |
|           | All Crops                      | 134   | 167  | 213  |
|           | Field Crops                    | 110   | 124  | 151  |
|           | Other                          | 161   | 217  | 284  |
|           | All Livestock & Poultry        | 122   | 160  | 209  |
|           | Livestock & Products           | 114   | 150  | 195  |
|           | Poultry & Products             | 143   | 187  | 243  |
| 9         | All Crops, Livestock & Poultry | 151   | 196  | 252  |
|           | All Crops                      | 155   | 201  | 258  |
|           | Field Crops                    | 151   | 175  | 210  |
|           | Other                          | 156   | 208  | 270  |
|           | All Livestock & Poultry        | 143   | 187  | 243  |
|           | Livestock & Products           | 135   | 178  | 231  |
|           | Poultry & Products             | 157   | 205  | 266  |
| 10        | All Crops, Livestock & Poultry | 115   | 151  | 198  |
|           | All Crops                      | 148   | 197  | 260  |
|           | Field Crops                    | 116   | 143  | 184  |
|           | Other                          | 162   | 223  | 294  |
|           | All Livestock & Poultry        | 102   | 134  | 174  |
|           | Livestock & Products           | 105   | 138  | 180  |
|           | Poultry & Products             | 71  | 93   | 120  |
| 11        | All Crops, Livestock & Poultry | 122   | 160  | 207  |
|           | All                            |   |      |      |
|           | All Crops                      | 136   | 178  | 228  |
|           | Field Crops                    | 47  | 58   | 75   |
|           | Other                          | 174   | 229  | 292  |
|           | All Livestock & Poultry        | 119   | 156  | 202  |
|           | Livestock & Products           | 115   | 151  | 195  |
| 12        | All Crops, Livestock & Poultry | 118   | 150  | 190  |
|           | All Crops                      | 131   | 156  | 187  |
|           | Field Crops                    | 131   | 156  | 187  |
|           | Other                          | ---   | ---  | ---  |
|           | All Livestock & Poultry        | 110   | 146  | 192  |
|           | Livestock & Products           | 110   | 146  | 192  |
|           | Poultry & Products             | ---   | ---  | ---  |
| C-NP      | All Crops, Livestock & Poultry | 152   | 194  | 249  |
|           | All Crops                      | 163   | 205  | 260  |
|           | Field Crops                    | 155   | 181  | 218  |
|           | Other                          | 172   | 235  | 313  |
|           | All Livestock & Poultry        | 135   | 177  | 231  |
|           | Livestock & Products           | 134   | 177  | 230  |
|           | Poultry & Products             | 139   | 182  | 236  |

<sup>1/</sup> Items included in each commodity group are as follows:

Field crops = small grains, hay, dry beans and peas

Other crops = sugar beets, potatoes, vegetables, fruits, nuts, berries, and miscellaneous crops

Livestock & products = beef and veal, pork, lamb and mutton, and milk

Poultry & products = broilers, turkeys, farm chickens, and eggs.

<sup>2/</sup> Projections are indexes of physical volumes weighted by prices, 1964 = 100.



## CROP YIELDS

The adoption of modern technology and resource developments has been responsible for a rapid increase of yields for many crops grown in the region. Forms which technology has taken include improved crop varieties, better methods for control of weeds and insects, improved water supply and management of land and water resources, higher levels of fertilization, improved harvesting and marketing facilities, and other improvements. The development and adoption of these improvements had been made possible by research, extension, education, and technical services available from institutions and agencies, as well as the increased availability of capital. The growth of irrigation is another significant factor affecting crop yields. In 1944 the Census of Agriculture estimated that irrigated land amounted to about 3.5 million acres in the region. In 1964, 5.6 million acres were irrigated. In addition, other land measures and watershed protection measures, such as drainage, have had an influence on increased yields.

To aid in the identification of future problems and the determination of the need for land and water resources, projections of crop yields were developed for the region. The projections are presented in table 31 and are based on a cooperative study with the state Agricultural Experiment Stations.

Each state Experiment Station was provided with common assumptions to specify the conditions under which the projections were estimated. The projections were to reflect the actual level of performance at an average level of management, and not such performance levels as might be expected from controlled plot and above average levels of management. The specific guideline assumptions are as follows:

1. General economic stability will prevail during the projection period. No major war or economic recession will occur and a high level of economic activity and nearly full employment will be maintained. This does not rule out periodic cyclical adjustments in economic activities.
2. Government programs are expected to exist during the projection period; however, market forces will be assumed to be the dominant factor in the allocation of resources. This implies a gradual decrease in production restraints and greater market influence during the projection period.
3. Government programs in extension and research will continue at present levels.
4. Marketing and transportation facilities will be

adequate to handle agricultural production.

5. Current normal price relationships among inputs, and between inputs and outputs, will continue throughout the projection period.

6. Credit availability, tenure arrangements, zoning, and taxation policies will not interfere with agricultural adjustments, including farm consolidation or adaptation of new technologies.

7. Fertilizer and livestock feeds of needed types and in sufficient quantities will be available at current normal prices.

8. Assuming existing cropping patterns and level of resource developments, disregard the effects on productivity of additional resource developments or changing cropping patterns.

In addition to the assumptions, the Experiment Stations were provided with time-series analysis of crop yields for the years 1939-1963 and 1949-1966, from Statistical Reporting Service data, and historical crop yields from selected Bureau of Reclamation projects as a statistical aid to the effort.

A wide variety of factors will affect the projected increases of crop yields. Gains in crop yields per acre will generally result from the following major factors:

1. Improvements in the average level of management. The average level of management for the projection periods will be at a higher level than that existing during the base year.

2. Conservation and improvement of the soil resource through continued and more widespread land treatment measures which prevent soil loss, conserve moisture, and prevent crop damage.

3. Improved varieties of crop strains.

4. Improved tillage methods, rate and date of seeding, seed treatment, and cultivation will be more widely adopted.

5. Insecticide and herbicide improvement, management and use has great potential for improved yields.

6. Greater use of fertilizer and improved types of fertilizer.

Table 31 - Projections of Weighted Yields for Crops  
in the Columbia-North Pacific Region

| Crop                     | Irrigated or<br>Non-Irrigated | Projections<br>Index Numbers 1964=100 |      |      |
|--------------------------|-------------------------------|---------------------------------------|------|------|
|                          |                               | 1980                                  | 2000 | 2020 |
| Barley                   | I                             | 134                                   | 158  | 186  |
| Barley                   | NI                            | 118                                   | 141  | 162  |
| Corn for Grain           | I                             | 107                                   | 128  | 147  |
| Corn for Grain           | NI                            | 105                                   | 115  | 115  |
| Winter Wheat             | I                             | 133                                   | 182  | 215  |
| Winter Wheat             | NI                            | 121                                   | 145  | 163  |
| Spring Wheat             | I                             | 160                                   | 186  | 236  |
| Spring Wheat             | NI                            | 131                                   | 155  | 174  |
| Oats                     | I                             | 126                                   | 189  | 231  |
| Oats                     | NI                            | 109                                   | 124  | 141  |
| Small Grains Cut for Hay | I                             | 101                                   | 104  | 107  |
| Small Grains Cut for Hay | NI                            | 98                                    | 107  | 115  |
| Corn Silage              | I                             | 101                                   | 127  | 164  |
| Corn Silage              | NI                            | 149                                   | 133  | 138  |
| Alfalfa Hay              | I                             | 127                                   | 156  | 186  |
| Alfalfa Hay              | NI                            | 128                                   | 147  | 164  |
| All Other Hay            | I                             | 143                                   | 165  | 219  |
| All Other Hay            | NI                            | 155                                   | 176  | 198  |
| Dry Beans 1/             | I                             | 130                                   | 152  | 172  |
| Dry Peas 1/              | I                             | 140                                   | 163  | 187  |
| Dry Peas                 | NI                            | 112                                   | 128  | 143  |
| Potatoes                 | I                             | 142                                   | 171  | 192  |
| Sugar Beets              | I                             | 132                                   | 146  | 159  |
| Hops                     | I                             | 127                                   | 150  | 171  |
| Mint Crops               | I                             | 140                                   | 168  | 201  |
| Forage Seed Crops 2/     | 3/                            | 104                                   | 132  | 157  |
| Snap Beans               | 3/                            | 145                                   | 218  | 256  |
| Sweet, Green Peas 2/     | 3/                            | 150                                   | 205  | 251  |
| Sweet Corn               | I                             | 180                                   | 244  | 304  |
| Strawberries             | I                             | 191                                   | 280  | 413  |
| Strawberries             | NI                            | 101                                   | 91   | 91   |
| Rye                      | 3/                            | 183                                   | 216  | 248  |
| Onions                   | 3/                            | 125                                   | 143  | 166  |
| Apples                   | I                             | 195                                   | 296  | 374  |
| Apples                   | NI                            | 211                                   | 318  | 398  |
| Pears                    | I                             | 173                                   | 285  | 421  |
| Pears                    | NI                            | 174                                   | 259  | 388  |
| Sweet Cherries           | I                             | 254                                   | 328  | 532  |
| Grapes                   | I                             | 149                                   | 164  | 180  |
| Prunes                   | I                             | 149                                   | 211  | 332  |
| Prunes                   | NI                            | 165                                   | 180  | 175  |
| Peaches                  | I                             | 167                                   | 219  | 271  |
| Peaches                  | NI                            | 157                                   | 171  | 214  |
| Apricots                 | I                             | 154                                   | 170  | 212  |
| Apricots                 | NI                            | 152                                   | 166  | 207  |
| Filberts 2/              | I                             | 200                                   | 296  | 394  |
| Walnuts 2/               | I                             | 43                                    | 86   | 143  |

1/ Oregon excluded.

2/ Idaho excluded.

3/ Includes both irrigated and non-irrigated acreage and production.

7. Greater effort toward adoption of crops and management systems for the natural environment.

8. Greater acceptance of water management practices, improved land preparation, water supply, and timeliness of irrigation will improve response of all crops on irrigated land.

The projected trends in crop yields were not uniform for every crop in each state, consequently, the state projections were weighted by acreages of the crops in each state to develop a weighted average yield for the region. These projections of weighted crop yields for the region are presented in table 31 as indices. The indices for the region can be used for developing subregional, or other geographical area, projections by being applied to the absolute levels of yield in those areas. The indices reflect a considerable degree of difference between crops, and for crops grown on both irrigated and nonirrigated land.

#### LAND RESOURCES AND USE

The data concerning land uses in this section of the report are based on the hydrologic drainage areas of the subregions and region, and not on the county boundary approximations as all the other economic data.

About 21 million acres of land are currently classified as cropland, of which approximately seven million acres are irrigated (table 32). Cropland comprises less than 12 percent of the total land area of the region. Forest land, on the other hand, accounts for nearly 50 percent of the land area of the region. Rangeland, in 1966, was nearly 59 million acres, or approximately 34 percent of the total land area. Other land (urban-industrial areas, farmsteads, airports and other areas) utilizes over eight million acres of the region. Each of these major land uses have different proportional relationships to the total land area in the subregions. A detailed discussion of these relationships is found in other study appendices (48) (49)(50). Also, detailed discussions and data concerning cropping patterns for irrigated and nonirrigated cropland is presented in those appendices, as is more detailed information on forest, range and other land uses.

Although cropland comprises less than 12 percent of the total land area, additional extensive areas of land are available in the region which are suitable for cultivation and crop production (table 33). About 51 million acres of land are

Table 32 - Major Uses of Land, Columbia-North Pacific  
Region and Subregions, 1966

| Subregion | Cropland      | Forest Land | Rangeland | Other Land | Total     |
|-----------|---------------|-------------|-----------|------------|-----------|
|           | (1,000 Acres) |             |           |            |           |
| 1         | 1,552.1       | 18,242.1    | 1,698.1   | 1,327.1    | 22,819.4  |
| 2         | 3,308.8       | 5,652.1     | 4,583.9   | 536.0      | 14,080.8  |
| 3         | 686.3         | 1,508.9     | 1,534.8   | 121.4      | 3,851.4   |
| 4         | 3,781.3       | 4,296.9     | 13,555.8  | 1,047.8    | 22,681.8  |
| 5         | 1,628.9       | 4,190.5     | 16,838.7  | 739.4      | 23,397.5  |
| 6         | 3,077.8       | 13,537.1    | 5,041.8   | 714.5      | 22,371.2  |
| 7         | 3,570.6       | 8,328.3     | 6,358.1   | 565.2      | 18,822.2  |
| 8         | 201.1         | 2,665.0     | 67.9      | 258.6      | 3,192.6   |
| 9         | 1,456.1       | 5,272.0     | 58.8      | 815.9      | 7,602.8   |
| 10        | 584.8         | 13,828.6    | 168.6     | 472.2      | 15,054.2  |
| 11        | 591.0         | 6,429.0     | 105.0     | 1,321.6    | 8,446.6   |
| 12        | 365.0         | 1,893.0     | 8,733.1   | 403.7      | 11,394.8  |
| C-NP      | 20,803.8      | 85,843.5    | 58,744.6  | 8,323.4    | 173,715.3 |

Source: Appendix IV, Land and Mineral Resource, Columbia-North Pacific Framework Study.



Table 33 - Acreages of Land Suitable for Crop Production by  
Capability Class, 1966, Columbia-North Pacific  
Region and Subregions

| Subregion | I     | Capability Class |          | IV       | Total                  |
|-----------|-------|------------------|----------|----------|------------------------|
|           |       | II               | III      |          |                        |
|           |       | (1,000 Acres)    |          |          |                        |
| 1         | 1.0   | 415.1            | 1,135.6  | 3,003.0  | 4,554.7                |
| 2         | 69.1  | 500.0            | 2,518.0  | 1,503.1  | 4,590.2                |
| 3         | 51.8  | 255.3            | 330.6    | 425.2    | 1,062.9                |
| 4         | ---   | 569.2            | 2,233.4  | 1,124.2  | 3,926.8                |
| 5         | 43.6  | 478.3            | 857.0    | 489.6    | 1,868.5                |
| 6         | 3.0   | 424.1            | 2,497.4  | 933.4    | 3,857.9                |
| 7         | 20.0  | 555.8            | 1,974.2  | 3,037.5  | 5,587.5                |
| 8         | 11.6  | 217.0            | 434.7    | 466.7    | 1,130.0                |
| 9         | 171.5 | 906.2            | 851.9    | 872.2    | 2,801.8                |
| 10        | 1.8   | 602.5            | 843.6    | 2,119.1  | 3,567.0                |
| 11        | ---   | 315.0            | 521.0    | 1,231.0  | 2,067.0                |
| 12        | ---   | 94.5             | 510.0    | 545.0    | 1,149.5                |
| C-NP      | 373.4 | 5,333.0          | 14,707.4 | 15,750.0 | 36,163.8 <sup>1/</sup> |

<sup>1/</sup> About 15 million acres of desert land in capability class VI are also potentially suitable for cropland when irrigated.  
Source: Appendix VIII, Land Measures and Watershed Protection, Columbia-North Pacific Framework Study.

suitable for crop production, which permits considerable opportunity for expansion of agricultural production if needed.

The projections of major uses of land are presented in table 34. Projections of the total land areas for each subregion were made by the Soil Conservation Service and were based upon the estimated changes in total water area for each time period by subregion, with the regional estimate being the sum of the subregional projections. The decrease in total land area by 2020 is about one-half of one percent.

Projections of cropland acres were based on several sources and factors. Historical trends of cropland for each subregion and the region were analyzed from Census of Agriculture data. Secondly, projections of irrigated cropland and nonirrigated cropland harvested for each subregion were obtained and analyzed from Appendix IX, Irrigation. Also, the historical relationship between irrigated cropland and total nonirrigated cropland, and nonirrigated cropland harvested and total nonirrigated cropland were examined. The projections of irrigated cropland had been related to the projections of agricultural production and crop yields in the Irrigation appendix. Based on the Projections of irrigated land and the nonirrigated cropland harvested, and their historical relationships to total cropland, projections for total cropland were determined for each subregion and summed to the region total.

The projected increase of total cropland in the region is about four percent by 2020 (less than a million acres). In general, cropland acreages in those subregions east of the Cascades will be increasing. Those subregions west of the Cascades will experience a decrease in cropland acreages as urban and industrial expansion occurs. Projected changes in the subregions are consistent with the past trends.

Projections of forest land were determined by estimating the losses or gains of forest land to or from the other major uses of land by the Forest Service. Forest land is projected to decline from about 86 million acres in 1966 to 84 million acres in 2020 (slightly over two percent). Nearly all subregions will experience a loss of acreages of forest land.

Other land is comprised of four distinct classifications for the purpose of comprehensive study; (1) barren land, (2) roads and railroads, (3) small waters, and (4) miscellaneous. The latter classification, miscellaneous, includes urban-industrial areas, farmsteads, airports and other areas. Projected changes in other land were derived from an analysis of areas and population in urban places. Regression analysis was used to relate population to acreages in urban areas. Also,

Table 34 - Major Uses of Land, 1966 and Projections for 1980, 2000, and 2020,  
Columbia-North Pacific Region and Subregions

| Subregion | Land Use            | 1966 <sup>1/</sup> | 1980                 | 2000    | 2020    |
|-----------|---------------------|--------------------|----------------------|---------|---------|
|           |                     |                    | (Thousands of Acres) |         |         |
| 1         | Cropland            | 1,552              | 1,737                | 1,739   | 1,930   |
|           | Forest              | 18,242             | 18,118               | 17,974  | 17,784  |
|           | Range               | 1,698              | 1,439                | 1,411   | 1,237   |
|           | Other               | 1,327              | 1,414                | 1,530   | 1,644   |
|           | Total               | 22,819             | 22,708               | 22,654  | 22,595  |
| 2         | Cropland            | 3,309              | 3,451                | 3,345   | 3,300   |
|           | Forest              | 5,652              | 5,624                | 5,653   | 5,674   |
|           | Range               | 4,584              | 4,363                | 4,360   | 4,300   |
|           | Other               | 536                | 570                  | 616     | 662     |
|           | Total               | 14,081             | 14,008               | 13,974  | 13,936  |
| 3         | Cropland            | 686                | 724                  | 736     | 768     |
|           | Forest              | 1,509              | 1,500                | 1,490   | 1,468   |
|           | Range               | 1,535              | 1,486                | 1,462   | 1,428   |
|           | Other               | 121                | 135                  | 153     | 173     |
|           | Total               | 3,851              | 3,845                | 3,841   | 3,837   |
| 4         | Cropland            | 3,781              | 3,906                | 3,872   | 3,860   |
|           | Forest              | 4,297              | 4,273                | 4,254   | 4,206   |
|           | Range               | 13,556             | 13,362               | 13,355  | 13,350  |
|           | Other               | 1,048              | 1,069                | 1,097   | 1,127   |
|           | Total               | 22,682             | 22,610               | 22,578  | 22,543  |
| 5         | Cropland            | 1,629              | 2,082                | 2,184   | 2,453   |
|           | Forest              | 4,191              | 4,174                | 4,152   | 4,129   |
|           | Range               | 16,839             | 16,332               | 16,200  | 15,897  |
|           | Other               | 739                | 764                  | 795     | 830     |
|           | Total               | 23,398             | 23,352               | 23,331  | 23,309  |
| 6         | Cropland            | 3,078              | 3,058                | 3,046   | 3,035   |
|           | Forest              | 13,537             | 13,492               | 13,436  | 13,380  |
|           | Range               | 5,042              | 5,040                | 5,038   | 5,036   |
|           | Other               | 714                | 763                  | 823     | 882     |
|           | Total               | 22,371             | 22,353               | 22,343  | 22,333  |
| 7         | Cropland            | 3,571              | 3,729                | 3,735   | 3,805   |
|           | Forest              | 8,328              | 8,274                | 8,206   | 8,118   |
|           | Range               | 6,356              | 6,176                | 6,162   | 6,106   |
|           | Other               | 565                | 613                  | 675     | 733     |
|           | Total               | 18,822             | 18,792               | 18,778  | 18,762  |
| 8         | Cropland            | 201                | 176                  | 145     | 134     |
|           | Forest              | 2,665              | 2,652                | 2,649   | 2,618   |
|           | Range               | 68                 | 65                   | 60      | 60      |
|           | Other               | 259                | 282                  | 312     | 344     |
|           | Total               | 3,193              | 3,175                | 3,166   | 3,156   |
| 9         | Cropland            | 1,456              | 1,384                | 1,420   | 1,250   |
|           | Forest              | 5,272              | 5,221                | 5,056   | 5,089   |
|           | Range               | 59                 | 55                   | 50      | 48      |
|           | Other               | 816                | 911                  | 1,031   | 1,156   |
|           | Total               | 7,603              | 7,571                | 7,557   | 7,543   |
| 10        | Cropland            | 585                | 472                  | 421     | 370     |
|           | Forest              | 13,829             | 13,795               | 13,747  | 13,700  |
|           | Range               | 168                | 160                  | 150     | 140     |
|           | Other               | 472                | 587                  | 676     | 764     |
|           | Total               | 15,054             | 15,014               | 14,994  | 14,974  |
| 11        | Cropland            | 591                | 470                  | 403     | 385     |
|           | Forest              | 6,429              | 6,419                | 6,336   | 6,189   |
|           | Range               | 105                | 105                  | 100     | 92      |
|           | Other               | 1,322              | 1,433                | 1,576   | 1,737   |
|           | Total               | 8,447              | 8,427                | 8,415   | 8,403   |
| 12        | Cropland            | 365                | 363                  | 361     | 352     |
|           | Forest              | 1,893              | 1,874                | 1,842   | 1,805   |
|           | Range               | 8,733              | 8,726                | 8,741   | 8,767   |
|           | Other               | 404                | 413                  | 424     | 436     |
|           | Total               | 11,395             | 11,376               | 11,368  | 11,360  |
| C-NP      | Cropland            | 20,804             | 21,552               | 21,407  | 21,642  |
|           | Forest              | 85,844             | 85,416               | 84,795  | 84,160  |
|           | Range               | 58,743             | 57,309               | 57,089  | 56,461  |
|           | Other               | 8,323              | 8,954                | 9,708   | 10,488  |
|           | Total <sup>2/</sup> | 173,716            | 173,231              | 172,999 | 172,751 |

<sup>1/</sup> Land and Mineral Resources, Appendix IV, Columbia-North Pacific Framework Study (rounded).  
<sup>2/</sup> Totals do not include large water bodies which are projected to increase.

several other studies provided additional information which was used in developing and evaluating the projections (59). Information from the Type 2 Willamette and Puget Sound Comprehensive River Basin Studies was utilized after making adjustments for different definitions of land uses and other criteria. The losses of forest lands to other land was also accounted for explicitly.

The projections of acres classified as other land increased from about 8.3 million acres in 1966 to 10.5 million in 2020. This is nearly a 26 percent increase. Those subregions west of the Cascades will have the largest increases in the other land category because of the greater expansion of population and industry.

Rangeland was determined as a residual after the projections of cropland, forest land, other land, and total land were derived. Generally, acreages of rangeland will decrease in nearly all the subregions and the region. Rangeland will decrease from about 58.7 million acres in 1966 to about 56.5 million acres (four percent) in 2020 in the region.

#### EMPLOYMENT

Agricultural employment decreased from 18 percent of total employment in the region in 1940 to about seven percent in 1960. Employment in agriculture has exhibited substantial decreases since 1940, while accompanied by significant increases in agricultural output. Agricultural employment decreased by approximately 30 percent from 1940 to 1960 (221 thousand to 156 thousand). However, the rate of decline was much greater during the 1950-1960 decade when employment dropped from 210 thousand to 156 thousand, according to the Census of Population. In agriculture, an increasing total output has been achieved by rapid increases in labor productivity and a substitution for farm-based inputs of materials and services purchased from other than farm sources. Greater labor efficiency has been accomplished in part by greater specialization, increased mechanization, and adoption of improved practices, which is indicated by the increase of inputs purchased by farmers from nonfarm sources.

Every subregion in the Columbia-North Pacific Region has experienced a decline in agricultural employment since 1940. Some subregions, such as 1 and 9, have experienced substantial decreases.

Projections of agricultural employment for the nation and water resources regions were developed in the national program.

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PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6  
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)  
JAN 71 J BOOTH, R DAWSON, A M GRANO

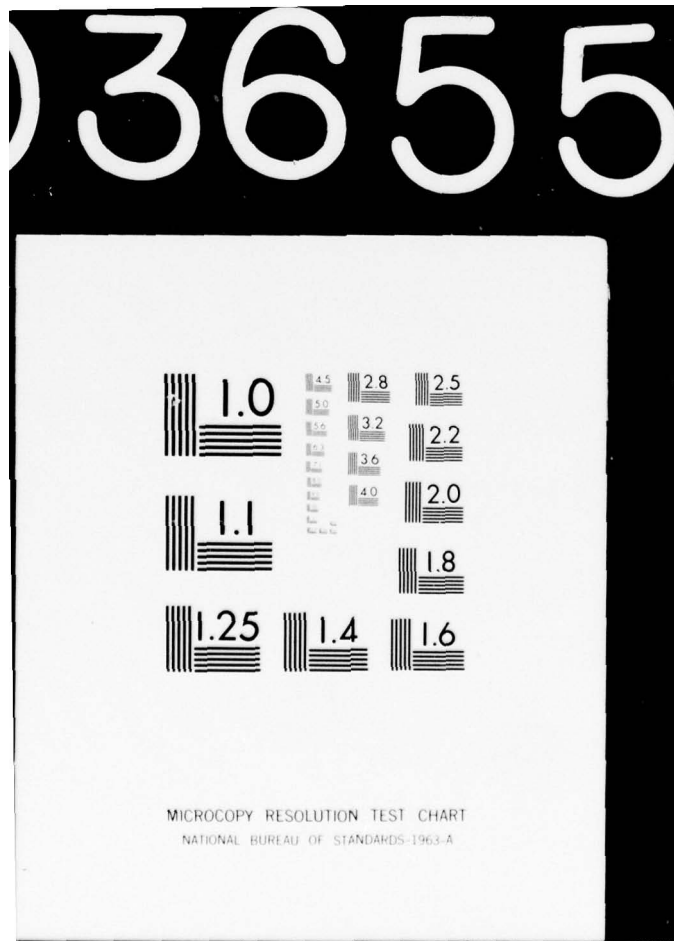
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Regional projections of agricultural employment indicate that there will continue to be substantial decreases. By 2020, employment in agriculture will decline to about 90 thousand employees and will be only about two percent of total employment in the region (table 35). Projections of agricultural employment for the subregions are all declining. These projections are based on past trends in agricultural employment and the relationships between projected changes in agricultural output and worker productivity. They assume that there will be increases in the number of full-time employees as under-employed farmers move out of agriculture, and also, decreases in seasonal part-time employees.

#### FARM POPULATION

As in the nation, the Columbia-North Pacific Region has experienced a substantial decrease in the rural farm population. National and regional trends indicate that while the rural farm population was declining, total population was increasing. Thus, about 23 percent of the total population was classified as rural farm in 1940 but by 1960 only seven to eight percent were so classified in the nation and region. Associated with these changes, the nonfarm (urban and rural nonfarm) population comprised about 77 percent of total population in 1940 and increased to about 93 percent by 1960 in both the nation and region.

Table 36 presents the population characteristics for all subregions and the region for 1960, with projections for 1980, 2000, and 2020.

Projections of total population for the region and subregions are from the Office of Business Economics study, prepared for Water Resources Council (67). The projections of the farm population for each subregion were based on several types of analysis. Historical trends of the nonfarm population for the period 1940 to 1960 were extended as projections from Census of Population data. Projections of the nonfarm population were then subtracted from total population to estimate the farm population. The rural farm estimates were then analyzed with respect to trends in farm numbers and farm employment.

Based on these factors, the rural farm population for the region was projected to decline from 443 thousand persons in 1960 to about 185 thousand in 2020. The rural farm population in 2020 will comprise only about one and a half percent of the total population. The nonfarm population (urban and rural nonfarm) will increase from about 93 percent of total population

Table 35 - Agricultural Employment 1960, with Projections for 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregion | 1960 <u>1/</u> | 1980        | 2000  | 2020 |
|-----------|----------------|-------------|-------|------|
|           |                | (Thousands) |       |      |
| 1         | 10.5           | 7.6         | 6.3   | 5.2  |
| 2         | 14.4           | 12.3        | 11.9  | 10.4 |
| 3         | 15.5           | 12.8        | 12.2  | 10.5 |
| 4         | 21.9           | 16.6        | 15.3  | 12.8 |
| 5         | 17.9           | 13.7        | 12.8  | 11.1 |
| 6         | 10.2           | 7.4         | 6.1   | 4.9  |
| 7         | 11.8           | 8.9         | 8.4   | 6.8  |
| 8         | 4.9            | 3.6         | 3.3   | 2.5  |
| 9         | 21.7           | 16.0        | 14.7  | 11.2 |
| 10        | 8.1            | 7.1         | 6.5   | 5.4  |
| 11        | 17.8           | 13.0        | 10.7  | 8.4  |
| 12        | 1.1            | 1.0         | .9    | .8   |
| C-NP      | 155.8          | 120.0       | 109.1 | 90.0 |

1/ Estimated from OBE and Census of Population.

Table 36 - Total Farm and Nonfarm Population, 1960 with Projections for 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregions  | Population<br>Characteristic | 1960 <sup>1/</sup> | 1980    | 2000    | 2020     |
|-------------|------------------------------|--------------------|---------|---------|----------|
| (Thousands) |                              |                    |         |         |          |
| 1           | Total                        | 563.7              | 699.1   | 897.1   | 1,140.4  |
|             | Farm                         | 36.3               | 23.3    | 19.7    | 15.5     |
|             | Nonfarm <sup>2/</sup>        | 527.4              | 675.8   | 877.4   | 1,124.9  |
| 2           | Total                        | 193.5              | 253.0   | 334.0   | 431.3    |
|             | Farm                         | 35.7               | 24.5    | 20.6    | 16.2     |
|             | Nonfarm                      | 157.8              | 228.5   | 313.4   | 415.1    |
| 3           | Total                        | 227.6              | 280.7   | 355.2   | 443.7    |
|             | Farm                         | 32.6               | 23.2    | 19.0    | 15.4     |
|             | Nonfarm                      | 195.0              | 257.4   | 336.2   | 428.3    |
| 4           | Total                        | 277.2              | 350.9   | 450.5   | 576.0    |
|             | Farm                         | 69.4               | 51.2    | 43.0    | 35.2     |
|             | Nonfarm                      | 207.8              | 299.7   | 407.5   | 540.4    |
| 5           | Total                        | 252.5              | 328.7   | 430.4   | 553.5    |
|             | Farm                         | 47.9               | 30.1    | 25.5    | 20.0     |
|             | Nonfarm                      | 204.6              | 298.6   | 404.9   | 533.5    |
| 6           | Total                        | 155.9              | 193.5   | 234.6   | 274.3    |
|             | Farm                         | 26.6               | 18.4    | 15.0    | 11.7     |
|             | Nonfarm                      | 129.3              | 175.1   | 219.6   | 262.6    |
| 7           | Total                        | 198.7              | 251.4   | 321.9   | 404.4    |
|             | Farm                         | 28.5               | 19.1    | 15.5    | 12.0     |
|             | Nonfarm                      | 170.2              | 232.3   | 306.4   | 392.4    |
| 8           | Total                        | 224.5              | 277.9   | 349.4   | 441.3    |
|             | Farm                         | 20.1               | 13.3    | 10.1    | 7.1      |
|             | Nonfarm                      | 204.4              | 264.6   | 339.3   | 434.2    |
| 9           | Total                        | 1,168.9            | 1,727.3 | 2,397.6 | 3,237.1  |
|             | Farm                         | 69.0               | 43.4    | 32.8    | 25.6     |
|             | Nonfarm                      | 1,099.9            | 1,683.9 | 2,364.8 | 3,211.5  |
| 10          | Total                        | 381.4              | 465.4   | 575.4   | 708.9    |
|             | Farm                         | 27.2               | 17.6    | 14.7    | 10.9     |
|             | Nonfarm                      | 354.2              | 447.8   | 560.7   | 698.0    |
| 11          | Total                        | 1,768.1            | 2,449.7 | 3,345.3 | 4,448.1  |
|             | Farm                         | 47.9               | 23.8    | 17.8    | 13.7     |
|             | Nonfarm                      | 1,720.2            | 2,425.9 | 3,327.5 | 4,434.4  |
| 12          | Total                        | 13.9               | 16.3    | 18.7    | 21.3     |
|             | Farm                         | 2.1                | 1.9     | 1.7     | 1.6      |
|             | Nonfarm                      | 11.8               | 14.4    | 17.0    | 19.7     |
| C-NP        | Total                        | 5,426.1            | 7,293.9 | 9,710.1 | 12,680.3 |
|             | Farm                         | 443.3              | 289.8   | 235.4   | 184.9    |
|             | Nonfarm                      | 4,982.8            | 7,004.1 | 9,474.7 | 12,495.4 |

<sup>1/</sup> Census of Population, 1960.

<sup>2/</sup> Sum of Urban and Rural-Nonfarm population.

in 1960, to about 98 percent in 2020. All subregions will experience declining farm populations in the future, especially those subregions west of the Cascades where population growth and industrial expansion is the greatest.

#### SUMMARY

Agriculture is an important industry in the region. In 1964 the value of agricultural production exceeded \$1.5 billion and over 150,000 persons were employed in agriculture. About 60 percent of the value was from crops and 40 percent from livestock and poultry. The industry utilizes a significant proportion of the region's land and water resources for producing a great variety of agricultural commodities. Of the 21 million acres of cropland, about seven million acres are irrigated (49). Rangeland and forest land are also utilized by the livestock industry.

Agriculture is expected to continue as an important industry in the future, with output increasing nearly one and a half times by the year 2020. The production of all crops will increase by about 160 percent, and all livestock and poultry, 131 percent. By 2020 the value of all crops produced (in constant dollars) will represent about 64 percent (60 percent in 1964) of the total value of production, and livestock and poultry, 36 percent (40 percent in 1964). Increases in output by subregions will range from two to threefold by 2020. Employment, on the other hand, will decrease substantially in the region and subregions by 2020.

Projected increases in agricultural output will be accompanied by changes in the structure of the agricultural industry. Substitution of capital inputs for labor and land, as well as shifts in the organization and use of resources, will continue. Further reductions in the numbers of farms are in prospect as smaller farms are consolidated into larger commercial farms. Increased productivity per worker and per acre will be influenced primarily by additional resource development, such as irrigation and drainage, new technology, and more extensive use of capital inputs.



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## THE MINERAL INDUSTRY IN THE REGION'S ECONOMY

### INTRODUCTION

The Columbia-North Pacific Region contains a wealth of mineral resources. The Coeur d'Alene mining district in northern Idaho has produced mineral wealth exceeding \$2 billion, mostly as silver, lead, and zinc. The Butte mining district in southwestern Montana has exceeded \$3.8 billion in value of production, mostly as copper. Very few mining districts in the world have reached a total production of such proportions. Both of these districts have produced continuously for the past 100 years and have potential reserves to continue production for decades in the future.

The total mineral production value in the region in 1965 was \$388 million. In that year, Idaho mineral production was valued at \$105 million, Washington's was valued at \$86 million, and Oregon's was \$81 million. In Montana for 1965, production of copper, gold, silver, lead, and zinc, virtually all of which were produced within the Columbia-North Pacific Region, was \$101 million.

An important segment of total mineral production is the industrial mineral operations which are found in each of the 12 subregions. Production of sand and gravel, crushed rock, limestone, pumice, expandable shale, brick and tile clay, and refractory clay is often a local activity with the mine and the market in close proximity. The construction industry is heavily dependent on commodities such as sand and gravel and stone. Production of these commodities in 1965 in the Columbia-North Pacific Region totaled 103 million tons valued at \$125 million.

Bituminous coal has been produced in significant quantities in the past; however, Diesel fuels, hydroelectric power and natural gas have, to a major extent, displaced coal as a source of energy in the region. Mining of coal has shown a declining trend over the past several decades. A potential for coal production exists in the future as a fuel source for coal-fired, steam-electric-generating plants.

Trend analysis and projections in this report have been done in terms of constant dollar value using Bureau of Mines developed price deflators for various commodity groupings. The

constant dollar series reduces the bias caused by price level variations, thus showing more nearly the real change in the annual value of mineral production. The annual totals were constructed by summing the constant dollar value of several mineral groups. These groups were converted to 1957-59 constant dollars by dividing the group current dollar value by the appropriate group implicit price deflator.

#### METALS

Mines in the region, particularly those in Idaho and Montana, have supplied important portions of the U. S. base-metal output. Montana, the leading copper-producing state from 1887 to 1907, has generally ranked among the top three states in copper output with a cumulative total of over eight million tons, mostly from the Butte mining district. Montana also was the leading zinc-producing state in five post-World War II years. In 14 of 20 postwar years, Idaho ranked either first or second in zinc output among the states and ranked second to Missouri in lead output during all but five years since 1907.

Nearly all of the known base-metal and silver reserves and resources in the region are in the areas that have supplied most of the production of these metals to date. The Coeur d'Alene mining region of Shoshone County, Idaho, contains the largest lead ore reserves, while northeastern Washington hosts the biggest zinc deposits, and most copper ore exists in the Butte district. Idaho has substantial quantities of silver ore, but large amounts of silver are contained in base-metal ores in the Butte district. Known Oregon deposits contain only small quantities of copper, lead, zinc, and silver. Vast tonnages of submarginal lead and zinc are inferred to exist in northeastern Washington with lesser quantities in Idaho and Montana. The Cascade Mountains of Washington contain sizable deposits of low-grade copper ore which may be profitably extracted in the future. The average gold and silver content of most Pacific Northwest base-metal deposits is small, with the exception of silver in Idaho lead-zinc ores, but the overall total is significant because of the large tonnages of ore involved. The silver content of many Coeur d'Alene district base-metal ores ranges up to 20 ounces per ton. At many deposits in the region, by-product recovery is important to the profitability of the operation.



## NONMETALS

Nonmetallic mineral commodities have been produced in substantial quantities in the region. Total value of nonmetal commodities produced from 1948 through 1965 has exceeded \$2 billion. Sand and gravel and stone output has accounted for a major portion of this total (\$1.2 billion). Other major nonmetal commodities produced over the base period were cement, clays, lime, magnesite, olivine, phosphate rock and vermiculite. The aforementioned nine major nonmetal commodities, over the base period 1948-65, have accounted for over 97 percent of the total nonmetal production value for the region. The share that these nine commodities have contributed to the nonmetal total has ranged from 95 to 99 percent annually.

Sand and gravel is a ubiquitous material in the region; however, only deposits near urban markets or convenient to construction projects are generally developed or considered of economic value. The total supply of sand and gravel is virtually inexhaustible; however, some problems arise locally due to the increasing competition of other land uses, particularly in and near urban centers.

Dimension stone and crushed stone are the principal stone products in the region. Dimension stone is used for buildings, fireplaces, and other construction; its production is of minor economic importance as the market is small and irregular. Crushed stone is produced in large quantities from many varieties of raw material such as limestone, basalt, ultramafic and granitic intrusive rocks, sandstone, quartzite, and other sedimentary and metamorphic rocks. Principal uses for crushed stone are for concrete aggregate, road surfacing, and railroad ballast. Most of the roadstone is produced from small roadside quarries used intermittently when there is local need for the material. Numerous stone quarries are situated near urban centers where there is a large and continuous need for aggregate. Limestone has many uses in addition to that of aggregates or roadstone. These other uses depend on the purity of the deposit. Limestone is quarried in Montana for metallurgical use and manufacture of lime. In Idaho it is quarried for cement, lime, pulp and paper manufacture, sugar refining, metallurgical and agricultural use.

Clay occurs widely over the region. Its physical and mineralogical character largely determines its use. Common clays are the most widely distributed and are mined in numerous places (generally near urban centers or areas of denser population and industry), for manufacturing common brick and tile. The higher grade refractory-type clays and high-alumina clays, which are much more valuable and are found in more limited areas,

occur in Latah County, northern Idaho (where a plant at Troy is producing firebrick and refractories, and a plant at Bovill produces paper-filler-grade clay); near Spokane; and near Seattle, where intermediate to high heat duty refractories are produced. Deposits of refractory-grade clays are well known in Cowlitz and Lewis Counties, Washington, and in Marion, Washington, and Lane Counties, Oregon, but very little production has come from these areas in the past.

Phosphate rock production is of major importance to the economy of Montana and Idaho. It is used in manufacture of phosphate fertilizers, elemental phosphorus, and some minor products. Phosphate rock is mined north of Garrison in Powell County and near Maxville, Granite County, in Montana. A plant produces elemental phosphorus in Silver Bow County from raw material from outside the region. Bingham, Caribou, and Bannock Counties in southeastern Idaho are the center of western phosphate resources and production. Fertilizer and elemental phosphorus plants are located at Pocatello and Soda Springs.

Vermiculite is mined at a large open-pit mine near Libby, Montana. This mine is the principal source of this material in the United States. Resources are extensive, and an increase in future production is anticipated.

Fluorspar is mined from deposits near Darby, Montana. The mine has been producing since 1952, and reserves are sufficient for several more years at the present rate.

Barite is produced near Greenough, Montana. Production is limited by available markets.

Garnet comes from placer deposits in Benewah County, Idaho. Production is limited mainly by available markets. Resources are adequate for many years of future production.

The olivine production in the region comes from Skagit and Whatcom Counties, Washington. This is one of the largest deposits known in the nation. Reserves are sufficient for many years at the present production rate.

Pumice and volcanic cinders are present in many areas of southeastern Idaho, in Washington, and Oregon. The resources are virtually inexhaustible. Production is limited by presently available markets.



## MINERAL FUELS

The predominant coal reserves of the region are in western Washington; coal reserves remaining in Washington are estimated to be 6.2 billion tons. Approximately 150 million tons of coal has been produced from mines in the state; in 1965 production was 55,000 tons. Interest in coal has been revived in recent years based on plans for coal-fired thermal-electric plants to supplement the present hydroelectric generating capacity. Most of the known coal reserves are in King, Kittitas, Pierce, Lewis, and Cowlitz Counties, Washington. Oregon has some formerly productive coal fields, but there has been no production in recent years. Most of the coal reserves of the state are in the Coos Bay area of southwestern Oregon.

There are no producing oil or gas fields in the Columbia-North Pacific Region. There has been considerable exploratory drilling. Some gas and a few oil shows have been discovered but, to date, none have proved economic.

## PROJECTIONS

### Metals

The copper, lead, and zinc industries of the Columbia-North Pacific Region were reviewed for the Bonneville Power Administration (BPA) (33). In that study, production of copper, lead, and zinc from Pacific Northwest mines was projected through 1985 (table 37). Extensions of trends also were made for smelter production for the period 1985-2010 (33).

Table 37 - Estimated Production of Copper, Lead, and Zinc, 1965, with Projections to 1970, 1980, and 1985, Pacific Northwest

| Year               | Copper                              | Lead   | Zinc    |
|--------------------|-------------------------------------|--------|---------|
|                    | (Tons of Recoverable Metal Content) |        |         |
| 1965 <sup>1/</sup> | 120,000                             | 79,920 | 114,000 |
| 1970 <sup>2/</sup> | 146,000                             | 85,000 | 137,000 |
| 1980 <sup>2/</sup> | 168,000                             | 85,000 | 142,000 |
| 1985 <sup>2/</sup> | 178,000                             | 85,000 | 145,000 |

<sup>1/</sup> Bureau of Mines Minerals Yearbook.

<sup>2/</sup> Knostman, Richard W., and Gary A. Kingston. Copper, Lead, and Zinc Industries in the Pacific Northwest, report prepared for Bonneville Power Administration, Portland, Oregon, 1966.

The review of the copper, lead, and zinc outlook for BPA was based on economic and population projections which were greater than those adopted as basic assumptions for the Columbia-North Pacific study. The projections made for the copper, lead, and zinc industry outlook in this report take into account the lower economic and population projections, and the resulting projections have been scaled downward accordingly.

Metal projections through 1980 are tied largely to the copper, lead, and zinc industry outlook study done for BPA and to a silver study by the Bureau of Mines. Copper, lead, zinc, silver and gold production have accounted for over 90 percent of the metal output value in the region over the past 20 years. Therefore, the metals projections for the Columbia-North Pacific Region were based mainly on projected values for these commodities.

Projections of copper, lead, and zinc production for the years 2000 and 2020 were made largely by extending trends projected for the period 1965-85. Silver projections beyond 1980 were based on increases projected for copper ore output from which silver is recovered as a co-product. Also, an assumption was made that no price change would be experienced in the outlook period for gold. Any significant price change could alter the outlook for this metal.

Metals produced over the past 18 years, other than base and precious metals, were manganese, chromium, tungsten, mercury, nickel, antimony, uranium, vanadium, cobalt, columbium-tantalum, and rare earths. Production value has ranged from \$8 million to \$18 million over this period with peak production being reached in 1956. Manganese has accounted for predominant production value under the "other metals" category. Nickel, uranium, tungsten, antimony, and cobalt all have been produced in significant amounts. In 1965, nickel, manganese, uranium, vanadium, and mercury supplied the bulk of the "other metals" total.

Projections of metals production values for the Columbia-North Pacific Region for target years 1980, 2000, and 2020 are shown in table 38.

#### Nonmetals

Markets for certain of the nonmetal commodities, such as olivine, vermiculite, and phosphate rock, extend outside the Columbia-North Pacific Region and, in certain instances, the markets are national in scope. Markets for sand and gravel,

Table 38 - Value of Mineral Production, 1965, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region

| Mineral Group | 1965 <sup>1/</sup>         | 1980    | 2000    | 2020    |
|---------------|----------------------------|---------|---------|---------|
|               | (Thousand 1957-59 Dollars) |         |         |         |
| Metals        | 153,074                    | 189,000 | 215,000 | 233,500 |
| Nonmetals     | 200,086                    | 226,200 | 326,700 | 442,500 |
| Fuels         | 694                        | 24,000  | 24,000  | 24,000  |
| Total         | 353,854                    | 439,200 | 565,700 | 700,000 |

<sup>1/</sup> Bureau of Mines data.

stone, cement, lime, and clays are generally tied more closely to regional development and regional markets.

The methods of projecting certain of the major commodities are reviewed in the following sections. Projections in many instances were based largely on production trends of the past 15 to 20 years.

#### Sand and Gravel and Stone

A leading mineral industry activity, both in terms of quantity and value, in the region is the production of sand and gravel and stone. Since 1948, production of these commodities has totaled over one billion tons valued at over \$1.2 billion. Production of these commodities over the past five years has averaged 72 million tons and \$99 million annually. In 1965, output of these commodities totaled 103 million tons valued at \$127.6 million f.o.b. pit or quarry.

The projection of sand and gravel and stone production in the region was calculated from the relationship of the output of these commodities with population of the region over the base period of 1948-65. The least squares linear equation which describes this relationship for this period is as follows:

$$y = -122.87 + 31.06(x) \\ r^2 = .89$$

where

y = sand and gravel and stone production, million tons, and  
x = population of the Columbia-North Pacific Region, millions.

The production data, whenever possible, were adjusted to exclude tonnages of sand and gravel and stone required by the

U. S. Army Corps of Engineers at dam projects and related works in the area. These requirements were large and of a periodic nature and introduced fluctuations in the output total from year to year.

Assuming the population reaches the projected 7.3 million by 1980, and that the relationship between aggregate production and population continues as during the base period, production of sand and gravel and stone would be 104 million tons annually.

Projecting aggregate production by the least squares linear equation for target years 2000 and 2020 placed production of these commodities at what was judged to be unrealistic annual output totals. The rapid growth in the use of construction aggregates is expected to modify as the region ages; therefore, projections for the growth of sand and gravel and stone production were arbitrarily reduced to correspond to the anticipated population growth in years subsequent to 1980. Even so, the projected tonnages resulting from this extrapolation probably should be considered as high-range estimates.

Based on the projected population growth, output of these commodities in the region would be approximately 138 million and 180 million tons in 2000 and 2020, respectively. The projections beyond 1980 should be viewed as little more than a point of reference. The demand will result primarily from construction needs of an expanding population.

#### Cement

Continuing expansion is foreseen for cement consumption as requirements increase to supply a growing population. Nearly one-half of the demand for cement nationally results from residential construction; therefore, population growth should continue to serve as a major factor. Highway construction under the Federal-State highway program uses significant quantities of cement and it is anticipated that highway building will continue to require substantial quantities for this purpose.

Cement consumption in the region could not be related to total aggregate output because quantities of these materials were used for road base, asphalt surfacing, railroad ballast, and miscellaneous fill. A recent study forecasts cement consumption for the Pacific Northwest at 1.8 barrels per capita which results in a long-term growth rate of about 2.1 percent annually through 1985 (52). Per capita consumption of cement in the four Pacific Northwest states has averaged 1.82 barrels



for the period 1948-65. Based on past trends of per capita consumption and the projected regional population, cement production for the region was projected at an average annual growth rate of approximately 1.5 percent for the outlook period.

#### Phosphate Rock

The phosphate rock mining and processing industry of the Pacific Northwest was reviewed for BPA in 1964 (53). In this report, production of phosphate rock by producers in the Western States was projected to be 7.2 million long tons by 1980, 16.2 million tons by 2000, and 24.0 million tons in 2010.

Production of phosphate rock in the Columbia-North Pacific Region has trended well with the Western States production; consequently, projections for the region production were made based on the outlook for Western States industry for the years 1980, 2000, and 2010. Projections to 2020 were made by extending the trend projected for the decade 2000 to 2010.

#### Vermiculite

The consumption of vermiculite will be influenced largely by the volume of future residential and public building activities. The trend in construction design is toward the greater use of lightweight concrete aggregate, and consumption of vermiculite is expected to increase for this use as well as for the use of vermiculite as masonry fill. Vermiculite for acoustical and fireproofing purposes, pipe covering, and horticultural use is expected to maintain a gradual increase. Vermiculite produced in Montana goes to national markets; therefore, growth was tied largely to population growth projections for the United States during the outlook period. Crude vermiculite produced in Montana has been showing a moderate upward trend over the past decade. A continuation of this trend was projected for the outlook period resulting from the construction requirements of an expanding population.

#### Lime

Primary lime production in the region was projected based on anticipated increased lime consumption in the area. Long-term annual growth rate for production of primary lime was projected at a rate of approximately 2.3 percent.

Lime consumption (primary open-market) in the region was projected on the basis of past trends in per capita consumption.



Per capita use, based on a time-series trend, would increase from 54 pounds in 1965 to 67 pounds by 1980. Based on population projections for the Columbia-North Pacific Region and the per capita trend forecast, annual primary open-market lime consumption in the region by 1980 would be 244,000 tons.

#### Clays

Clay production was projected on the basis of a time-series linear trend. The value of total clays produced in the Columbia-North Pacific Region was projected to increase at an average annual rate of approximately 1.3 percent through 1980. The growth rate was projected to be somewhat lower after 1980.

#### Other Nonmetal Commodities

In addition to the foregoing major nonmetal commodities produced in the region, each year there are produced significant quantities of barite, natural carbon dioxide, diatomite, fluorspar, garnet, grinding pebbles, perlite, pumice, and soapstone. The value of these commodities produced in 1965 totaled \$3.3 million, about two percent of the total value of nonmetallic mineral production. The value of these commodities over the base period 1948-65 has ranged from \$1.6 million to \$5.2 million and, percentagewise, these commodities have accounted for one to five percent of the total value of non-metal mineral production.

Diatomite, garnet, fluorspar, perlite, and pumice have accounted for the major portion of the other nonmetal category total over the past two decades. Reserves of diatomite, garnet, and perlite are significant and the potential for increased production of these commodities over the outlook period appears favorable.

Projection for the "other nonmetals" category was made on the relationship between this group of commodities and the other major nonmetals over the past 18 years.

Projected nonmetal mineral production values for target years 1980, 2000, and 2020 are shown in table 38.

## Fuels

### Bituminous Coal

Mining of coal began in the Columbia-North Pacific Region over 100 years ago but the industry achieved major importance only in the state of Washington.

Bituminous coal occurrences are known in Teton, Bonneville, Fremont, and Clark Counties in Idaho; however, production of coal in Idaho has been small because of competition of higher rank coal from neighboring states and high-cost mining caused by deformation of the coal beds (71).

There are no official records of commercial bituminous coal production from known deposits in western Montana; however, coal has been mined on a small scale to supply local demand from time to time.

The potential for the coal mining industry in the Pacific Northwest was reviewed for BPA in 1965 (52). From the conclusions reached in this study, it appears that the best potential for Pacific Northwest coal is as a fuel for generating electric energy at mine-mouth, steam-electric plants.

Projections for Pacific Northwest coal production, as shown in the BPA report, are given in table 39.

Table 39 - Coal Production, 1965, with Projections to 1980, 2000, and 2010, Pacific Northwest

| <u>1965</u> <sup>1/</sup> | <u>1980</u> <sup>2/</sup> |                | <u>2000</u> <sup>2/</sup> |                | <u>2010</u>    |                |
|---------------------------|---------------------------|----------------|---------------------------|----------------|----------------|----------------|
|                           | <u>Maximum</u>            | <u>Minimum</u> | <u>Maximum</u>            | <u>Minimum</u> | <u>Maximum</u> | <u>Minimum</u> |
|                           |                           |                | (Thousand Tons)           |                |                |                |
| 55                        | 11,465                    | 100            | 40,285                    | --             | 47,705         | --             |

<sup>1/</sup> Bureau of Mines data.

<sup>2/</sup> Perry, Harry and others, and H. F. Jones, H. Zinder & Associates, Engineers and Consultants, Coal, Report prepared for Bonneville Power Administration, 1965, pp. 176 and 192.

The coal requirements that were projected to be supplied from mines in the Pacific Northwest (table 39) exhibit a wide range between the maximum and the minimum for each of the target years 1980, 2000, and 2010.

Because most of the major hydroelectric sites in the Pacific Northwest will be developed by 1975, it is anticipated that the area will require at least one million kilowatts of new thermal generation for energy purposes each year thereafter. This means that the region will require at least one large steam plant, nuclear or coal-fired, each year beginning in 1975 (70).

Because there is a lack of more precise estimates and specific figures to project coal production, output from mines in the region was arbitrarily projected at 50 percent of the maximum shown in the above quoted report for the target year 1980 and approximately 15 percent for target years 2000 and 2020. The value of fuels output in the region in constant dollars for selected years for the period 1965-2020 is shown in table 38.

The projections were made on the basis of anticipated coal requirements for the steam-electric generation plant under construction near Centralia, Washington.

#### Petroleum and Natural Gas

Despite significant drilling and exploration efforts in the past, no significant commercial discoveries of petroleum or natural gas are known to have been made in the Columbia-North Pacific Region.

The petroleum resources of the State of Montana occur east of the Continental Divide beneath the Great Plains. This area is outside the region.

The potential for petroleum and natural gas is impossible to assess with any degree of accuracy at this time. Because of the negative results of the discovery attempts to date, no petroleum or natural gas output was projected over the outlook period.

#### REVIEW BY SUBREGIONS

Table 40 reviews the mineral production trends in the 12 economic subregions of the Columbia-North Pacific Region.

Mineral production trends in terms of constant dollars are shown for the individual subregions (table 40). Projections for the various subregions were done largely by disaggregating the overall Columbia-North Pacific projections shown in the tables and reviewed in the foregoing sections. Subregional shares of the region's future output was allocated largely on the basis of the production value that a particular subregion

Table 40 - Mineral Production Value, 1950, 1960, and 1965, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregion                   | Actual <sup>1/</sup>       |         |         | Projected |         |         |
|-----------------------------|----------------------------|---------|---------|-----------|---------|---------|
|                             | 1950                       | 1960    | 1965    | 1980      | 2000    | 2020    |
|                             | (Thousand 1957-59 Dollars) |         |         |           |         |         |
| 1                           | 165,696                    | 114,363 | 159,591 | 192,500   | 226,000 | 259,000 |
| 2                           | 16,892                     | 15,393  | 13,292  | 13,900    | 16,500  | 20,500  |
| 3                           | 4,190                      | 2,531   | 2,928   | 5,400     | 5,400   | 6,800   |
| 4                           | 6,669                      | 14,390  | 29,159  | 37,600    | 69,900  | 103,000 |
| 5                           | 6,791                      | 6,831   | 11,868  | 13,900    | 16,600  | 20,500  |
| 6                           | 3,353                      | 3,370   | 6,787   | 12,400    | 15,700  | 19,000  |
| 7                           | 2,253                      | 16,509  | 17,299  | 5,400     | 6,600   | 7,800   |
| 8                           | 1,515                      | 2,197   | 3,677   | 26,400    | 26,600  | 27,500  |
| 9                           | 10,453                     | 22,470  | 32,932  | 43,400    | 59,500  | 78,200  |
| 10                          | 3,853                      | 14,727  | 23,126  | 15,000    | 19,500  | 22,300  |
| 11                          | 16,816                     | 25,475  | 39,885  | 73,000    | 103,000 | 135,000 |
| 12                          | 22                         | 386     | 1,459   | 300       | 400     | 400     |
| Undistributed <sup>2/</sup> | 12,981                     | 7,856   | 11,851  | --        | --      | --      |
| C-NP                        | 251,484                    | 246,498 | 353,854 | 439,200   | 565,700 | 700,000 |

<sup>1/</sup> Bureau of Mines data.

<sup>2/</sup> Value of mineral commodities produced that could not be assigned to specific counties of origin -- largely sand and gravel and stone.



has contributed to the overall region total during the past 15 to 20 years. Allocation was made by means of ratio and/or regression analysis of the subregion and region data for the base period 1948-65. When the resource potential did not appear to be adequate to support the continuation of the past trends or when development of a resource potential appeared underway or imminent, the individual commodity projections were tied to other variables, such as expected population growth, or to other studies done previously on a commodity, regional, or national basis.

The aggregated grouping of all metals, nonmetals, and fuels was used in projecting the subregional mineral production values.

#### EMPLOYMENT IN MINING

Trends and projections for employment in mining in the Columbia-North Pacific Region and for the 12 economic subregions of the area are given in table 41.

Estimates of average employment in mining were made on the basis of trends in mineral production value per employee during the period 1940-60, based on three points in time: 1940, 1950, and 1960. Projections of employment were made by dividing the projected value of mineral production in constant dollar terms by the projected value of output per employee in constant dollars, consistent with productivity trends of the past 20 years.

Attempts to account for productivity increases over the base period by subregion introduced biases because of the different base from which employment figures are derived as opposed to the mineral production values as measured by the Bureau of Mines. Cement and lime add significantly to the Bureau's mineral production values; however, employment data for these industries are reported under the manufacturing classification. This factor has become increasingly significant in recent years as greater tonnages of limestone have been imported and used for raw material at cement and lime plants in the Pacific Northwest. Also, considerable employment engaged in producing sand and gravel is classified under the ready-mixed concrete category of Standard Industrial Classification Group 32, Stone, Clay, and Glass Products. In 1965, over 3,500 employees were reported under the ready-mixed concrete category in Oregon and Washington.

Mining employment for the region was projected taking into consideration past productivity trends and extending these



Table 41 - Employment in Mining, 1940, 1950, 1960, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Subregion | Actual <sup>1/</sup> |        | Projected |        |       |
|-----------|----------------------|--------|-----------|--------|-------|
|           | 1940                 | 1950   | 1960      | 1980   | 2020  |
| 1         | 13,629               | 11,443 | 8,346     | 7,200  | 4,900 |
| 2         | 1,198                | 842    | 289       | 260    | 200   |
| 3         | 1,125                | 726    | 150       | 190    | 110   |
| 4         | 510                  | 381    | 174       | 530    | 670   |
| 5         | 1,505                | 611    | 193       | 220    | 160   |
| 6         | 1,106                | 524    | 251       | 480    | 360   |
| 7         | 486                  | 243    | 187       | 90     | 110   |
| 8         | 161                  | 201    | 75        | 250    | 220   |
| 9         | 583                  | 841    | 525       | 800    | 900   |
| 10        | 1,260                | 420    | 467       | 250    | 190   |
| 11        | 2,460                | 1,443  | 681       | 1,700  | 2,000 |
| 12        | 21                   | 19     | 80        | 30     | 30    |
| C-NP      | 24,044               | 17,694 | 11,418    | 12,000 | 9,850 |

<sup>1/</sup> U. S. Department of Commerce, Office of Business Economics.

trends through the outlook period. The regional totals were then allocated on the relationship that the productivity per employee in the individual subregions has held to the overall regional productivity over the past 15 to 20 years, and on the basis of the projected subregional mineral production values for target years 1980, 2000, and 2020. Mining employment had been projected in previous studies of the Willamette and Puget Sound subregions (23)(54).

# OTHER COMMODITY-INDUSTRIES

## OTHER COMMODITY PRODUCING INDUSTRIES

### PETROLEUM REFINING AND RELATED PRODUCTS

The petroleum industry only recently became of significance to the Columbia-North Pacific Region. Prior to 1954 the region had some paving and roofing materials manufacturers and other petroleum-related activities, but petroleum refining activity was limited to four very small refineries producing less than 10,000 barrels per day in total. Since then, refining capacity has become fairly substantial, and prospects for further expansion are good.

#### Petroleum Refining

In 1954 a 35,000 barrel-per-day refinery was constructed on the northeast shore of Puget Sound. It was followed by three more refineries in the next several years and by 1964 regional refinery capacity amounted to 180,000 barrels per day.

The principal refineries in the region are all located on Puget Sound where especially deep harbors allow easy access for modern deep-draft tankers carrying crude petroleum or refinery products. Crude petroleum is now supplied mainly through the Trans-mountain pipeline from Alberta, and products are marketed via the Olympic pipeline down through major population centers to the Columbia River and beyond via the Southern Pacific pipeline through the Willamette Valley to Eugene. Growth in capacity has been mainly to supply regional markets, however, a significant part of production is exported from the region. In 1966 waterborne shipments of refinery products amounted to about 81,000 barrels per day.

Regional markets for the local refining industry are mainly confined to the heavily populated area west of the Cascades which contains about 2/3 of the regional population. The principal market areas east of the Cascades are supplied by product pipelines from Utah and eastern Montana running in an arc through southern Idaho, the Spokane area, and western Montana. By 1964 local refinery capacity amounted to about 50 percent of regional consumption. Growth of regional markets and growth in the proportion of consumption locally produced is expected to require about 400,000 barrels-per-day capacity by



1980 without regard for potential export production (12-61).

The likelihood of export production from local crude oil supplies has largely disappeared in the absence of significant discoveries in recent explorations off the Oregon and Washington coasts, but supplies from the Prudhoe Bay discovery in northern Alaska are anticipated to require additional refinery capacity in the Columbia-North Pacific Region.

#### Related Products

Other activities of the petroleum industry include the productions of asphalt and tar paving mixtures, and roofing felts, cements and coatings, and the compounding of lubricating oils and greases. These activities are less concentrated geographically than refining, and they have been extant in the region a longer period of time. In 1966 there were 31 employer units (establishments) employing 569 workers in these industries.<sup>1/</sup>

Table 42 - Employment in Related Petroleum Products,  
Columbia-North Pacific Region Excluding Western Montana, 1966

| <u>Industry</u>                      | <u>Employer Units</u> | <u>Employment</u> |
|--------------------------------------|-----------------------|-------------------|
| Paving and roofing materials         | 19                    | 498               |
| Misc. products of petroleum and coal | 12                    | 71                |
| Total related petroleum products     | 31                    | 569               |

Source: Data from employment security agencies of Idaho, Oregon and Washington.

Regional consumption of the products of these industries is extensive and expanding. In 1962 regional sales of petroleum asphalts totalled over 850,000 tons, and sales of lubricating oils and greases amounted to 1,280,000 barrels (12-122). Demand for both these product categories will expand substantially in the future.

#### Employment Projections

Projections of future employment by the Office of Business

<sup>1/</sup> Excluding western Montana.



Economics indicate some growth in employment to 1980 in the petroleum and related products industries, but declining employment in the years beyond as productivity gains outrun increases in output.

Table 43 - Petroleum and Related Products Employment, 1960, with Projections to 1980, 2000 and 2020, Columbia-North Pacific Region and Subregions

| Subregion                      | 1960  | 1980  | 2000  | 2020  |
|--------------------------------|-------|-------|-------|-------|
| 1                              | 324   | 372   | 397   | 382   |
| 9                              | 424   | 670   | 589   | 474   |
| 11                             | 1,928 | 1,661 | 1,625 | 1,290 |
| All other subregions <u>1/</u> | 148   | 353   | 363   | 332   |
| C-NP                           | 2,824 | 3,056 | 2,974 | 2,478 |

1/ Projections not disclosed by subregion but included in regional total.

Source: U.S. Department of Commerce, Office of Business Economics, Preliminary Report on Economic Projection for Selected Areas, January 1969.

#### CHEMICALS AND ALLIED PRODUCTS

Employment in the chemicals industry in the Columbia-North Pacific Region was about 16,000 in 1960 and accounted for approximately 1% of total regional employment. This was about 60% of the number which would have been employed if the industry had been of the same relative size in the region as it was in the nation as a whole.

The regional industry is dominated by nuclear materials production (included in SIC 281, Basic Industrial Chemicals), but it is nevertheless widely diversified. Every one of the eight industrial categories comprising the industry nationally is represented in the region. The structure of the industry regionally, however, differs from the nation's. Apart from basic industrial chemicals, the most important categories in the region are: agricultural chemicals; paints and allied products; and miscellaneous chemicals. In the nation, aside from basic industrial chemicals, they are: plastics, resins, and fibers; drugs; and soaps, detergents, and cosmetics.

Table 44 - Percentage Composition of Chemicals and Allied Products Employment, Columbia-North Pacific Region and United States, 1963

| SIC | Category                    | C-NP Region | United States |
|-----|-----------------------------|-------------|---------------|
| 281 | Basic industrial chemicals  | 77.6%       | 32.1%         |
| 282 | Plastics, resins, fibers    | 2.3         | 19.6          |
| 283 | Drugs                       | 2.3         | 13.4          |
| 284 | Soap, detergents, cosmetics | 1.3         | 11.6          |
| 285 | Paints and allied products  | 4.9         | 8.3           |
| 286 | Gum and wood chemicals      | .1          | .9            |
| 287 | Agricultural chemicals      | 7.0         | 5.8           |
| 289 | Miscellaneous chemicals     | 4.6         | 8.2           |
|     | Total                       | 100.0%      | 100.0%        |

Source: 1963 Census of Manufactures, Industry Statistics. Regional data estimated in part.

The principal export products (interregional) of the regional industry are nuclear and phosphatic materials. Production of plutonium and other nuclear materials (in Subregion 3 with associated test facilities in Subregion 4) has been mainly for government use. Elemental phosphorus, phosphoric acid, and related fertilizer products produced from phosphate deposits in Subregion 4 are marketed for agricultural use throughout the western and central parts of the country.

Most of the other chemical production in the region is located in or near major population centers, and is for regional markets, especially in regional industry. Chlorine and caustic soda are produced chiefly for the regional pulp and paper industry although some caustic soda is marketed outside the region. Adhesives for the plywood industry, ammonia and sulphuric acid for fertilizers, and paints and allied products are also important products for industrial use. A surprisingly broad range of other basic and intermediate chemicals are produced for industrial markets. Drugs, soap, cleaning materials, and cosmetics go mainly to regional consumer markets.

### Character of the Industry

The chemicals industry is the most heterogeneous of all industries. It encompasses more products, processes, and raw materials than any other industry, and its activities are in a constant state of flux. Products of the industry are often highly substitutable in use, and the same product can be produced by a number of alternative techniques using different raw materials. These considerations make judgments about the future of the industry difficult, but some generalizations can be made.

The chief raw materials of the basic inorganic chemicals industry are salt, lime, phosphate, potash and sulphur. The basic organic chemicals are now principally obtained from petroleum. A large part of these basic chemicals are, in turn, the raw materials of the rest of the chemical industry, and they may be transformed into intermediate products to serve as raw materials for further processing within the chemicals industry several times before emerging as end-products of the industry as a whole.

Markets for the industry are diverse, but specific markets for a major share of production can be identified. The distribution of output for the major parts of the industry was compiled in the 1958 input-output study for the nation (68). It shows that drugs, cleaning, and toilet preparations (representing about 27 percent of the whole chemical industry's production) go largely to medical services (9%) and consumers (56%). About six percent of this sector's production goes back into the industry for further processing and the rest is broadly distributed.

Markets for the other parts of the chemicals industry are almost solely industrial. Paints and allied products (accounting for eight percent of the chemical industry's products) are sold mainly to maintenance and repair construction (47%), new construction (11%), and governments (5%), with the balance going to other industries such as automobiles, furniture, etc.

Plastics and synthetics (17% of industry production) are used largely in textiles and apparel industries (34%), the rubber industry (21%), and the chemical industry itself (9%). Other significant users of this sector's output, each consuming over two percent of production, include pulp and paper, tobacco, glass, and non-ferrous metals.

The rest of the chemicals industry, including the basic chemicals, agricultural chemicals, and miscellaneous chemical

products (totalling 49 percent of chemical production), supplies the chemicals industry (37%), agriculture (10%), governments (8%), petroleum (4%), pulp and paper (3%), rubber (3%), and more minor amounts to almost every other industry in the economy.

The location of industries is normally influenced to a considerable degree by the location of their raw materials and their markets. In the case of the chemicals industry, the basic raw materials which have exerted a significant influence on location are phosphate rock and petroleum refinery products. Other basic raw materials are fairly ubiquitous or economically shipped to points of consumption. Raw materials produced by the chemicals industry itself influence plant locations for further processing in varying degrees. Markets are a more pervasive locational influence. Roughly 50 percent of the output of the chemicals industry is consumed in manufacturing activities (including chemicals), thus the industry tends to agglomerate in manufacturing centers. Production of soaps, cleaning materials, toilet preparations and paints and allied products tends to correspond with population distribution, but drug production is heavily concentrated in several eastern states due largely to institutional factors.

#### Prospects for the Regional Industry

The prospects for future development of the industry in the region must be characterized as fairly modest in terms of the extremely high expectations of the national industry. While resources or raw materials limitations are not likely to severely handicap development, neither is an abundance of raw materials likely to promote sharp growth. Phosphate deposits, one of the two raw materials significant to plant location, are adequate in the region. The other significant raw material, petroleum refinery products for the petrochemical industry, is not presently available in sufficient supply to support significant development, although it now appears plausible that expanded refinery operation resulting from the Alaskan North Slope discovery may permit establishment of this sector. A chemicals industry based on wood akin to the coal and petroleum chemicals industries has long been a matter of interest to the region, however, the absence of progress on the technical problems involved makes the possibility of such a development remote.

Markets for the regional industry may be expected to expand more rapidly than the growth of industry and population would suggest because of the increasing use of chemicals. Major industrial users in the region, particularly agriculture and the wood products industries, will require substantially



augmented supplies of chemicals, and the need for chemicals in manufacturing as a whole will grow as the region's share of manufacturing increases. The future of the nuclear products sector is the most uncertain factor in the industry's prospects. Production of power reactor fuel or treatment of wastes are potential major activities, but production volumes or employment requirements cannot be projected with any confidence. Other substantial demands for nuclear production may develop, but they are not now on the immediate horizon.

Projections of national chemical production to the year 2000 made by Resources for the Future have been extrapolated to 2020 here as rough guides to expectations for the regional industry.

Table 45 - Projections of Production in Chemicals, United States

| Category                 | Projections<br>Index Numbers 1960=100 |      |       |
|--------------------------|---------------------------------------|------|-------|
|                          | 1980                                  | 2000 | 2020  |
| Chemicals and Products   | 243                                   | 531  | 1,159 |
| Chemical Products        | 205                                   | 433  | 913   |
| Drugs, soaps, toiletries | 226                                   | 492  | 1,068 |
| Paints                   | 111                                   | 185  | 308   |
| Fertilizers              | 182                                   | 290  | 461   |
| Industrial Chemicals     | 274                                   | 613  | 1,370 |
| Inorganic chemicals      | 238                                   | 564  | 1,337 |
| Organic chemicals        | 288                                   | 630  | 1,380 |
| Basic organic            | 249                                   | 462  | 858   |
| Synthetic                | 332                                   | 827  | 2,059 |

Source: Lundberg, H. H., et al, Resources in America's Future, Resources for the Future, Johns Hopkins Press, 1963, p. 326. Converted to 1960 base and extrapolated from 2000 to 2020 on basis of growth rate from 1980 to 2000.

Projections of regional production to 1985 for several important chemicals in the region have been made in three industry studies for the Bonneville Economic Base Study (26) (39)(53).

Projections of regional employment made by the Office of Business Economics are presented in table 46. Productivity increases will restrict employment growth relative to production.



Table 46 - Chemical and Allied Products Employment, 1960, with Projections to 1980, 2000 and 2020, Columbia-North Pacific Region and Subregions

| Subregion                      | 1960   | 1980   | 2000   | 2020   |
|--------------------------------|--------|--------|--------|--------|
| 1                              | 612    | 844    | 1,186  | 1,634  |
| 2                              | 481    | 615    | 767    | 919    |
| 3                              | 7,529  | 9,400  | 11,632 | 13,982 |
| 4                              | 2,426  | 3,653  | 5,358  | 7,341  |
| 8                              | 209    | 232    | 349    | 489    |
| 9                              | 1,746  | 2,683  | 4,037  | 5,655  |
| 11                             | 2,888  | 4,110  | 5,745  | 7,591  |
| All other subregions <u>1/</u> | 443    | 778    | 1,193  | 1,728  |
| C-NP                           | 16,334 | 22,315 | 30,267 | 39,339 |

1/ Projections not disclosed by subregion but included in regional total.

Source: U.S. Department of Commerce, Office of Business Economics, Preliminary Report on Economic Projections for Selected Areas, January 1969.

#### FOOD AND KINDRED PRODUCTS

Food and kindred products processing is an important segment of the manufacturing complex in the Columbia-North Pacific Region. Census of Manufacturers data indicate that during 1963 the value added by manufacturing food and kindred products was approximately 745 million dollars. In the states of Oregon and Washington, the value added in manufacturing these products accounted for 15 and 13 percent, respectively, of all manufacturing during the year 1963. In this year over 82 million production worker man-hours were utilized in food processing operations.

Total food and kindred products processing (Standard Industrial Classification 20) has been divided into eight distinct product classifications for clarification and presentation in this section. These classifications and their included commodities are: 201 - meat and poultry slaughtering;

202 - dairy products; 203 - canning and preserving fruits, vegetables, potatoes and seafoods; 204 - grain mill products; 205 - bakery products; 206 - sugar beets for sugar; 207 - confectionary and related products; 208 - beverages. An additional product classification, miscellaneous food and kindred products, has been incorporated under the total food and kindred products heading. This procedure was followed because of the diverse nature of the products within this classification as well as its relative magnitude--five percent. of the adjusted value added by manufacturing during 1963.

Processing of manufactured food items varies substantially with respect to the particular subregion and product classification. During 1963, Subregion 11 accounted for 31 percent of the adjusted value added by manufacturing in the region (table 47) while Subregion 12 accounted for less than one-tenth of one percent. Canning and preserving fruits, vegetables, and seafoods comprised 31 percent of the adjusted value added for the region while dairy products processing contributed 15 percent. Approximately 25.9 million dollars of value added is not shown in table 47 due to disclosure rules not allowing appropriate three digit industry breakdown. This omission amounts to approximately 3.5 percent of the total adjusted value added by manufacturing.

Average annual employment in food and kindred products processing in the region during 1960 was approximately 59,000 employees (table 48). A large portion of these employees, 40 percent, were employed in canning and preserving fruits, vegetables, potatoes and seafoods. The Puget-Willamette Trough (Subregions 8, 9, and 11) employed over 54 percent of the annual employment in the region.

Factory production of manufactured food and kindred products for the year 1963 is shown in table 49. Canned, frozen and dehydrated fruits, vegetables, potatoes and seafoods comprised the largest single processed commodity group with over 4.8 billion pounds of product input.

The slaughtering and processing of meat and poultry products during 1963 accounted for more than 1.5 billion pounds of plant input. The Puget-Willamette Trough slaughtered and processed 914 million pounds of meat and poultry products, or 59 percent of the region's total. Approximately 65 percent of slaughtering in the region was beef, with pork accounting for an additional 21 percent.

Of the more than 2.1 billion pounds of dairy products produced during 1963, approximately 77 percent was distributed in the form of fluid milk and cream. Cheese and ice cream

Table 47 - Adjusted Value Added in Manufacturing Food and Kindred Products, by Industry Code, Columbia-North Pacific Region and Subregion, 1963

| Subregion                      | Total (20)1/ | Industry Code |         |         |        |        |        |           |        |
|--------------------------------|--------------|---------------|---------|---------|--------|--------|--------|-----------|--------|
|                                |              | 201           | 202     | 203     | 204    | 205    | 206    | 207       | 208    |
| (Thousand Dollars)             |              |               |         |         |        |        |        |           |        |
| 1. Clark Fork-Kootenai-Spokane | 44,435       | 9,291         | 13,918  | 923     | 2,982  | 6,972  | 3,739  | 240       | 4,434  |
| 2. Upper Columbia              | 21,956       | 895           | 1,097   | 5,284   | 262    | 74     | 11,447 | 310       | 1,079  |
| 3. Yakima                      | 33,467       | 4,351         | 6,089   | 11,794  | 78     | 1,746  | 5,119  | 60        | 2,219  |
| 4. Upper Snake                 | 64,532       | 3,183         | 11,761  | 23,429  | 2,932  | 1,218  | 19,682 | <u>2/</u> | 1,621  |
| 5. Central Snake               | 66,693       | 5,162         | 6,886   | 27,099  | 2,517  | 2,785  | 20,261 | --        | 927    |
| 6. Lower Snake                 | 6,210        | 596           | 1,178   | 2,678   | 447    | 645    | --     | --        | 666    |
| 7. Mid Columbia                | 44,931       | 794           | 1,335   | 36,831  | 2,541  | 413    | --     | --        | 2,161  |
| 8. Lower Columbia              | 17,787       | 2,074         | 2,452   | 4,310   | 654    | 37     | --     | 60        | 7,916  |
| 9. Willamette                  | 159,628      | 14,420        | 23,627  | 45,015  | 8,875  | 40,035 | 29     | 3,672     | 12,746 |
| 10. Coastal                    | 38,805       | 1,005         | 5,080   | 23,740  | 1,344  | 5,155  | --     | 60        | 1,745  |
| 11. Puget Sound                | 221,051      | 25,047        | 33,897  | 42,178  | 22,074 | 29,947 | --     | 5,196     | 46,294 |
| 12. Oregon Closed Basins       | 82           | 48            | --      | --      | --     | --     | --     | --        | 34     |
| C-NP Total                     | 719,577      | 66,866        | 107,320 | 223,281 | 44,706 | 89,027 | 60,277 | 9,598     | 81,842 |

1/ Total of SIC 20 omits approximately 25,893 thousand dollars due to disclosure rules not allowing appropriate three-digit classification. Includes Miscellaneous Food and Kindred Products (209).

2/ Dashes indicate data not available or no manufacturing of the appropriate commodities within the subregion.

Table 48 - Employment in Manufacturing Food  
and Kindred Products, Columbia-North Pacific  
Region and Subregions, 1960

| Subregion | 1960   |
|-----------|--------|
| 1         | 4,539  |
| 2         | 1,022  |
| 3         | 3,329  |
| 4         | 4,773  |
| 5         | 5,287  |
| 6         | 1,040  |
| 7         | 2,741  |
| 8         | 2,264  |
| 9         | 12,884 |
| 10        | 3,973  |
| 11        | 16,994 |
| 12        | 57     |
| C-NP      | 58,903 |

Source: Office of Business Economics, USDC, 1968.

(including ice milk and milk sherbert) were the next major dairy product categories, each accounting for approximately seven percent of total output. Subregion 9 was the largest producer of dairy products with approximately one-third of total regional output. Subregion 11, with 22 percent of the region's output, and Subregion 1, with 14 percent, were the other two areas of major dairy products processing.

The composition of processed fruits, vegetables, potatoes, nuts and seafood (SIC 203) varied greatly between subregions. Subregions 4 and 5, which produced 46 percent of the regional output in this product classification, specialized in canned and frozen fruits and vegetables and frozen and dehydrated potato products. Subregions 9 and 11 processed large quantities of canned and cured seafoods, frozen packaged fish, and canned and frozen fruits and vegetables.

Approximately 80 percent of the flour milling and milling of prepared feeds for animals and fowl was done in the Puget-Willamette Trough in 1963. Blended and prepared flours produced in this area are used extensively by firms processing bread and related products (SIC 205). In fact, 83 percent of the region's output of bread and related products was produced in this same area.

During 1963 sugar beet processing was mainly confined to

Table 49 - Factory Production in Manufacturing Food and Kindred Products, by Industry Code, Columbia-North Pacific Region and Subregions, 1963

| Subregion | Total (20) 1/ | Industry Codes |           |           |           |         |           |        |           |                   |  |
|-----------|---------------|----------------|-----------|-----------|-----------|---------|-----------|--------|-----------|-------------------|--|
|           |               | 201 2/         | 202 3/    | 203 4/    | 204 5/    | 205 6/  | 206 7/    | 207 8/ | 208 9/    | (Thousand Pounds) |  |
| 1         | 1,140,154     | 187,612        | 295,567   | 31,030    | 270,073   | 52,314  | 105,300   | 1,388  | 157,603   |                   |  |
| 2         | 537,635       | 16,932         | 23,333    | 91,150    | 21,691    | 611     | 326,249   | 1,762  | 23,190    |                   |  |
| 3         | 671,789       | 82,352         | 129,501   | 203,634   | 7,107     | 14,360  | 145,891   | 320    | 47,668    |                   |  |
| 4         | 2,144,310     | 113,442        | 191,774   | 1,197,077 | 34,563    | 6,965   | 565,026   | --     | 41,529    |                   |  |
| 5         | 2,014,520     | 163,224        | 112,844   | 1,027,382 | 34,563    | 15,496  | 583,565   | --     | 23,743    |                   |  |
| 6         | 220,726       | 13,538         | 21,724    | 136,726   | 29,416    | 3,652   | --        | --     | 15,670    |                   |  |
| 7         | 900,977       | 19,714         | 27,693    | 544,963   | 253,908   | 1,839   | --        | --     | 39,260    |                   |  |
| 8         | 399,659       | 39,252         | 51,983    | 72,726    | 59,226    | 306     | --        | 320    | 170,059   |                   |  |
| 9         | 3,020,624     | 400,688        | 476,027   | 500,843   | 886,683   | 343,545 | --        | 19,438 | 215,369   |                   |  |
| 10        | 645,893       | 26,505         | 102,523   | 315,633   | 134,265   | 25,280  | --        | 320    | 30,042    |                   |  |
| 11        | 5,531,363     | 474,104        | 721,005   | 727,749   | 1,999,487 | 246,258 | --        | 29,849 | 998,589   |                   |  |
| 12        | 1,206         | 1,024          | --        | --        | --        | --      | --        | --     | 182       |                   |  |
| C-NP      | 17,228,856    | 1,558,387      | 2,153,974 | 4,848,913 | 3,698,419 | 710,626 | 1,726,031 | 53,397 | 1,762,904 |                   |  |

1/ Includes Miscellaneous Food and Kindred Products (209).

2/ Includes beef, veal, pork, lamb and mutton, chicken and turkey in liveweight equivalents. Does not include secondary processing under SIC 2013.

3/ Includes creamery butter, all cheese, condensed and evaporated milk, ice cream and frozen desserts, and fluid milk in pounds of final product.

4/ Includes canned, frozen and dehydrated fruits, vegetables, potatoes, nuts and seafoods in pounds of input. Does not include frozen and canned specialties, some preserves, jams and jellies.

5/ Includes flour and prepared feeds for animals and fowl. Does not include data for southern Idaho.

6/ Production data estimated from regional consumption of bread, biscuits, crackers, etc.

7/ Sugar production estimated at 305 to 320 pounds of sugar per ton of sugar beets, depending on the particular subregion.

8/ Weight of confectionery and related items distributed on the basis of number of employees in SIC 207 per subregion.

9/ For beverage industries: weight of still wines converted from wine gallons; beer production converted from barrels of 31 wine gallons; distilled spirits converted from tax gallons; soft drink production estimated from 1963 per capita consumption.

10/ Dashes indicate data not available or no manufacturing of the appropriate commodities within the subregion.



Subregions 2, 4, and 5. They processed approximately 85 percent of the region's sugar production. Quantities of sugar are shipped to Subregions 9 and 11 where 92 percent of the region's confectionary and related items were manufactured during 1963.

Approximately 80 percent of the beverages produced in the region during 1963 came from Subregions 8, 9, and 11. The region's major producers of malt and malt liquors are located in these subregions.

#### Projection Methodology

Projections of manufacturing food and kindred products for the region were drawn from an analysis of food processing operations during the years 1950 through 1965. Two methods were used in formulating these projections:

1. Plant marketing areas for each commodity were analyzed, and
2. Production-consumption ratios for each commodity and commodity group were computed.

Except where data limitations prevented such an approach, both of the above methods were used in projecting food manufacturing.

Marketing areas for individual commodities and commodity groups were studied to determine the total population served by each group of processors. Table 50 illustrates how the final demand for various processed food items, using the state of Washington as an example, serves varying marketing areas. The meat, dairy, bakery and soft drink industries market their products primarily in the Pacific Northwest. Other firms, such as those involved in processing fruits, vegetables, potatoes and seafoods, market their products over a national and international area.

An analysis of regional demand for certain processed foods can be extended to a study of subregion demand due to a high concentration of marketing activities to individuals and institutions located in counties surrounding each particular firm. By assuming some degree of short-run processing efficiency during the production year 1962-1963 among subregions, the average number of employees involved in processing a particular commodity within a subregion were compared to the total population of that subregion (44)(45)(67). Least-squares regressions illustrated that these employee-population relationships were highly significant for all subregions.

Table 50 - Washington State Marketing Areas Served by Firms, by Type of Product and Accumulated Percentage of Firms Marketing in Each Area, 1964 <sup>1/</sup>

| Marketing Area                  | Accumulated Percentage of Marketings Reported |                     |                         |                     |                               |
|---------------------------------|---|---------------------|-------------------------|---------------------|-------------------------------|
|                                 | Meat  | Dairy               | Canned and Frozen Foods | Grain Mill          | Bakery and Canned Soft Drinks |
| Local Counties                  | 57.8  | 75.7                | 11.7                    | 23.8                | 45.5 88.9                     |
| State of Washington             | 73.5  | 82.8                | 16.5                    | 27.0                | 59.1 96.3                     |
| Pacific Northwest               | 85.3  | 95.7                | 27.9                    | 66.7                | 86.4 100.0                    |
| Western United States           | 91.2  | 95.7                | 38.1                    | 71.5                | 95.5                          |
| National                        | 93.2  | 97.1                | 71.4                    | 90.5                | 95.5                          |
| Export                          | 100.0   | 100.0 <sup>2/</sup> | 100.0                   | 100.0 <sup>3/</sup> | 100.0                         |
| Number of Product-firm Listings | 102   | 140                 | 273                     | 63                  | 22 27                         |

<sup>1/</sup> Compiled from Washington Manufacturer's Guide, 1964. Based on individual product grouping basis and maximum distance of shipment.

<sup>2/</sup> Condensed and evaporated milk only.

<sup>3/</sup> Eighty percent of these firms exported prepared feeds for animals and fowl only.

Factory production of each particular commodity for a subregion was estimated from employment data and then summed to a three digit Standard Industrial Classification breakdown.

Secondly, projected factory production was calculated in a manner similar to that used by Stallings (56). It was assumed that the ratio of production to consumption within a region, for a particular processed commodity, would reflect demand as well as various costs of production and other factors affecting comparative advantage in production. Consumption-production ratios were calculated for 116 processed foods, each of which were adjusted to reflect changes in population, regional consumption differences, income, per capita consumption and family size for the period 1950-1965 where data were available (57)(58). These ratios were projected forward to 1980 and adjusted for per capita consumption changes estimated by Daly, Egbert and others (14). Per capita consumption of individual processed foods for the year 2000 and 2020 were held at the 1980 projection level. Projected production was then derived from the consumption-production ratios calculated for the period 1959-1961. Preliminary population estimates furnished by the Office of Business Economics, Department of Commerce, were used in determining total region and subregion consumption. Comparisons were then made to assure consistency between the projected levels of agricultural production and processing requirements for a subregion, combination of subregions, and the region.

In only one product classification was the above methodology not followed. Projected processing of sugar beets for sugar was based on the projected production of sugar beets from OBERS and assumed levels of sugar content.

Projected employment in food and kindred products processing is based on projected production within the region and subregions and adjusted for estimated changes in worker productivity on a three-digit Standard Industrial Classification basis (56-17)(62)(63). Differences in projected worker productivity between subregions for any particular industry group is the result of product differentiation for those subregions during the base year.

In projecting the manufacturing of processed foods by specific product classifications, the question of new products and new industries is quite important. It should be noted that the projections made in the following section fit within a present industrial classification definition. This means that new products, developed during the projection period, will be manufactured by an industry with a general composition as known today. Changes in the product mix by food processing

industries have been occurring for a number of years and a continuation of these changes is inherent to these projections.

### Projections

Projected processing of food and kindred products for each subregion and industry code are shown in table 51 for the years 1980, 2000 and 2020. This table illustrates varying rates of industrial growth for the three projection years.

The largest projected change in factory output between the years 1963 and 2020 is in the sugar beet processing industry (SIC 206). This large industrial growth is due, in part, to the assumption that the United States will maintain constant sugar import quotas after 1980.

Substantial increases in meat slaughtering are projected to occur in the region. Most of this increase will be associated with beef, with relatively large increases occurring in Subregions 4 and 5.

Output changes in dairy products processing will be associated with the following products: creamery butter, cheese (including cottage cheese), ice cream, ice milk, and milk sherbert, and fluid milk and cream. Total output of processed dairy products is projected to increase 2.3 times the base period quantity by the year 2020 for the region.

The commercial processing of principal fruits and vegetables will continue to be an important segment of food processing in the region. Coupled with the projected output of processed potatoes and seafoods, the volume of processed commodities listed under SIC 203 is expected to more than triple by the year 2020. Processed sweet corn, green and waxed beans and potatoes will continue to play a major role in food processing. Subregion 11 is expected to continue its dominant role in processing fishery products.

Projected indices of adjusted value added in manufacturing are shown in table 52. The value added in manufacturing was derived by multiplying the projected quantities of output of an individual commodity times its price during the year 1963. Individual commodities were then summed to a three-digit Standard Industrial Classification total. Subregion 2 is expected to experience the greatest relative growth in value added due to continued expansion in fruit, vegetable, potato and sugar beet production.



Table 51 - Projected Indices of Factory Production in Manufacturing Food and Kindred Products, by Industry Code, Columbia-North Pacific Region and Subregions, 1980, 2000, and 2020 1/

| Subregion                            | Year and SIC Codes |      |      |        |      |      |        |      |      |        |      |      |
|--------------------------------------|--------------------|------|------|--------|------|------|--------|------|------|--------|------|------|
|                                      | Total (200) 2/     |      |      | 201 3/ |      |      | 202 4/ |      |      | 203 5/ |      |      |
|                                      | 1980               | 2000 | 2020 | 1980   | 2000 | 2020 | 1980   | 2000 | 2020 | 1980   | 2000 | 2020 |
| 1. Clark Fork-Southern-Spokane ..... | 129                | 179  | 246  | 153    | 211  | 291  | 120    | 166  | 229  | 171    | 216  | 287  |
| 2. Upper Columbia .....              | 217                | 344  | 522  | 157    | 216  | 298  | 120    | 165  | 229  | 175    | 242  | 336  |
| 3. Yakima .....                      | 162                | 236  | 339  | 157    | 216  | 298  | 120    | 165  | 228  | 175    | 242  | 336  |
| 4. Upper Snake .....                 | 170                | 246  | 313  | 176    | 243  | 335  | 136    | 187  | 259  | 182    | 250  | 278  |
| 5. Central Snake .....               | 163                | 236  | 305  | 176    | 242  | 334  | 135    | 189  | 261  | 181    | 250  | 285  |
| 6. Lower Snake .....                 | 184                | 254  | 279  | 161    | 221  | 305  | 128    | 176  | 243  | 207    | 285  | 279  |
| 7. Mid Columbia .....                | 166                | 230  | 318  | 157    | 216  | 298  | 121    | 167  | 230  | 177    | 244  | 339  |
| 8. Lower Columbia .....              | 154                | 215  | 297  | 157    | 216  | 298  | 120    | 165  | 228  | 176    | 242  | 338  |
| 9. Willamette .....                  | 148                | 205  | 286  | 157    | 215  | 297  | 122    | 168  | 232  | 173    | 239  | 247  |
| 10. Coastal .....                    | 163                | 225  | 312  | 163    | 224  | 310  | 122    | 168  | 232  | 178    | 246  | 242  |
| 11. Puget Sound .....                | 150                | 209  | 288  | 157    | 216  | 298  | 120    | 165  | 228  | 175    | 242  | 336  |
| 12. Oregon Closed Basins .....       | 161                | 321  | 440  | 142    | 283  | 391  | --     | --   | --   | --     | --   | --   |
| C-NP Total .....                     | 157                | 222  | 302  | 160    | 220  | 304  | 123    | 169  | 234  | 179    | 247  | 311  |

1/ Year 1963 = 100 for all index numbers.  
 2/ Includes Miscellaneous Food and Kindred Products (209).  
 3/ Includes miscellaneous food and kindred products, except meat, poultry, and turkey in livestock equivalents. Does not include secondary processing under SIC 2013.  
 4/ Includes bakery, confectionery, and related items distributed on the basis of number of employees in SIC 207 per Subregion.  
 5/ Includes canned, frozen and dehydrated fruits, vegetables, potatoes, nuts and seafood in pounds of input. Does not include frozen and canned specialties, some preserves, jams and jellies.  
 6/ Includes flour and prepared feeds for animals and fowl. Does not include data for southern Idaho.  
 7/ Production data estimated from regional consumption of bread, biscuits, crackers, etc.  
 8/ Sugar production estimated at 105 to 120 pounds of sugar per ton of sugar beets, depending on the particular Subregion.  
 9/ Weight of confectionery and related items distributed on the basis of number of employees in SIC 207 per Subregion.  
 10/ Weight of confectionery and related items distributed on the basis of number of employees in SIC 207 per Subregion.  
 11/ Includes production of wine, beer, and distilled spirits converted from barrels of 31 wine gallons; distilled spirits converted from tax gallons; soft drink production estimated from tax gallons; soft drink production estimated from tax gallons.  
 12/ Dashes indicate that production projections were not made due to lack of information or no manufacturing of the appropriate commodities during the base period.



Table 52 - Projections of Adjusted Value Added in Manufacturing  
All Food and Kindred Products, Columbia-North Pacific  
Region and Subregions, 1980, 2000, and 2020

| Subregion | 1980 | Projection Year and<br>Index Number <u>1/</u> |      |
|-----------|------|---|------|
|           |      | 2000  | 2020 |
| 1         | 137  | 189   | 260  |
| 2         | 210  | 327   | 493  |
| 3         | 161  | 231   | 328  |
| 4         | 158  | 230   | 307  |
| 5         | 161  | 233   | 308  |
| 6         | 171  | 221   | 277  |
| 7         | 172  | 237   | 330  |
| 8         | 131  | 217   | 300  |
| 9         | 145  | 203   | 281  |
| 10        | 172  | 238   | 330  |
| 11        | 150  | 208   | 288  |
| 12        | 161  | 302   | 418  |
| C-NP      | 154  | 219   | 302  |

1/ The base year for all index numbers is 1963, in 1963 dollars.

Employment in manufacturing food and kindred products is projected to decrease slightly over the 57 year projection period. By the year 2020, this decrease will be equal to approximately five percent of the 1960 labor force (table 53). Employment is projected to decrease within the region due primarily to the projected annual rate of worker productivity being assumed to be slightly greater than changes in total production.

Table 53 - Food and Kindred Products Employment, 1960, with  
Projections to 1980, 2000 and 2020, Columbia-North  
Pacific Region and Subregions

| Subregion | 1960 <u>1/</u> | 1980   | 2000   | 2020   |
|-----------|----------------|--------|--------|--------|
| 1         | 4,539          | 3,610  | 3,213  | 3,325  |
| 2         | 1,022          | 1,386  | 1,404  | 1,478  |
| 3         | 3,329          | 3,243  | 3,136  | 3,130  |
| 4         | 4,773          | 6,105  | 6,111  | 5,769  |
| 5         | 5,287          | 4,653  | 4,588  | 4,372  |
| 6         | 1,040          | 1,002  | 979    | 892    |
| 7         | 2,741          | 3,047  | 2,931  | 2,846  |
| 8         | 2,264          | 2,110  | 2,082  | 2,095  |
| 9         | 12,884         | 12,197 | 11,916 | 11,928 |
| 10        | 3,973          | 4,211  | 4,034  | 3,715  |
| 11        | 16,994         | 15,907 | 15,913 | 16,311 |
| 12        | 57             | 35     | 35     | 35     |
| C-NP      | 58,903         | 57,471 | 56,342 | 55,896 |

1/ Employment data obtained from the Office of Business  
Economics, 1968.

#### PRIMARY METALS INDUSTRIES

The primary metals industries are a relatively small but important component of the region's economy. In 1960 these industries comprised just over one percent of total employment in the region compared with the two percent they represented nationally. Regional producers, nevertheless, are major contributors to national supplies of aluminum, copper, zinc and some minor metals. These industries also are vital elements of the regional economy in providing products which serve as raw materials to other industry in the region.

The primary metals industries in the Columbia-North Pacific Region developed in large part to process regional mineral

resources, but major influences in the recent past have been the low cost hydroelectric power and water transportation facilities and the expanding markets of the region.

The outlook for these industries is described in the following sections. Outlooks for the primary smelting and refining industries represented by SIC codes 331, 332 and 333 are reviewed by the Bureau of Mines. Projections for the other industries in this industrial group have been prepared by the Corps of Engineers.

The reviews by the Bureau of Mines are based primarily on special industry studies completed for the Bonneville Power Administration as part of that agency's Economic Base Study of the Pacific Northwest. Production and employment projections are limited to those industries that the Bureau of Mines previously had reviewed for the Bonneville Power Administration and an aluminum study done for the Bonneville agency by Ivan Bloch and Associates.

#### Copper, Lead and Zinc

The primary copper, lead, and zinc smelting industry in the Columbia-North Pacific Region consists of a copper smelter and refinery at Tacoma, Washington; a copper smelter at Anaconda, Montana; a lead smelter at Kellogg, Idaho; and zinc smelters at Kellogg and Anaconda (24)(33)(54). The region's base metal mining industry is also served by two facilities outside the region; a lead smelter at East Helena, Montana and a copper refinery at Great Falls, Montana.

As markets for refined copper, lead and zinc in the region are small, most is sold to users in the Midwest and Eastern United States, although increasing amounts are being sold in California markets. A large portion of the refined metal from the Tacoma copper smelter is shipped to overseas markets.

Copper smelting within the region is expected to grow at a slower rate than the projected rate of increase in domestic consumption of over three percent annually. Using a productivity rate of 2.7 percent annually to 1985, as shown in a report for the Bonneville Power Administration (33), and extending productivity at 2.25 percent after 1985, indicates that employment in copper smelting will decline to 750 by the year 2020. Projected production and employment for copper as well as lead and zinc are shown in table 54.

Lead smelting growth within the region will continue to be influenced by the large reserves and accompanying smelter

capacity being developed in Missouri. It is believed that these eastern reserves can be exploited at less expense than can most western resources. A possible mitigating factor would be a sharp rise in the price of silver. Western operations would benefit more because western lead deposits characteristically contain a higher silver content than do eastern ores. The possible loss of certain segments of the lead market to substitute materials, that is, lead in gasoline due to pollution problems or turbine engine development, would decrease demand and adversely affect the western lead producer's situation.

Table 54 - Projected Copper, Lead and Zinc Production and Employment, Columbia-North Pacific Region, 1980, 2000 and 2020 <sup>1/</sup>

| Year | <u>Copper</u> |            | <u>Lead</u> |            | <u>Zinc</u> |            | Total Employment |
|------|---------------|------------|-------------|------------|-------------|------------|------------------|
|      | Tons          | Employment | Tons        | Employment | Tons        | Employment |                  |
| 1980 | 288,300       | 1,460      | 95,000      | 325        | 180,000     | 655        | 2,440            |
| 2000 | 326,000       | 1,050      | 100,000     | 210        | 200,000     | 460        | 1,720            |
| 2020 | 368,000       | 750        | 105,000     | 145        | 220,000     | 325        | 1,220            |

<sup>1/</sup> Productivity to 1985 projected at 2.7 percent annual growth; from 1985 to 2020, the rate was 2.25 percent.

The outlook for continuing zinc output is good because of the large quantity of low-grade resources existing within the region's confines--particularly in northeastern Washington--that could be utilized with improved technology and/or market prices. Smelting sizable amounts of foreign concentrates is anticipated to continue.

#### Ferroalloys

Abundant low-priced industrial power and expanding wartime needs for the alloys for steel brought numerous companies into the Pacific Northwest region (30)(32). Union Carbide Corporation erected a plant at Tacoma, Washington in 1941 and at Wenatchee, Washington for the government in 1942. The Anaconda Company constructed a plant at Anaconda, Montana to produce ferromanganese. Keokuk Electro-Metals Company, in 1948, purchased the Wenatchee plant built by Ohio Ferroalloys Corporation. Union Carbide Corporation built an alloy plant for the government at Mead, near Spokane, Washington to produce ferrosilicon for use in an adjacent magnesium plant. The Mead facility was

leased by Pacific Northwest Alloys, Inc. after the war to produce ferrochromium. Silicon metal continues to be produced from a plant built in 1953 at Springfield, Oregon by National Metallurgical Company. Hanna Nickel Smelting Company began producing ferronickel near Riddle, Oregon in 1954, utilizing nickel ore from a nearby deposit.

Ferrochromium production by Pacific Northwest Alloys, Inc. was terminated in 1962. Ohio Ferroalloys Corporation, in 1966, announced planned termination of production at Tacoma, Washington. Ferromanganese output by The Anaconda Company has ceased and will resume only if product value should increase significantly. It is not expected that other regional plants will be closed in the near future, but by 1975 production economics could require larger furnace size, which in turn might result in fewer plants. Estimated production and employment by the alloy industry for 1980, 2000, and 2020 are shown in table 55.

Table 55 - Projected Alloy Metal Production and Employment, Columbia-North Pacific Region, 1980, 2000 and 2020

|                                 | 1980    | 2000    | 2020    |
|---------------------------------|---------|---------|---------|
| Production (tons) <sup>1/</sup> | 275,000 | 524,000 | 975,000 |
| Employment                      | 750     | 425     | 350     |

<sup>1/</sup> Production totals include ferrosphosphorus.

Source: Kingston, Gary A., and Robert A. Miller, Alloy Metals Outlook in the Pacific Northwest States, report prepared for Bonneville Power Administration, Portland, Oregon 1966.

### Steel

Current steel production is centered in the most densely populated areas of the Pacific Northwest, Seattle and Portland. Although integrated steel plants in California, Colorado and Utah could be a depressant to steel production expansion in the Pacific Northwest, the geographic pattern of steel output has been breaking up and trending toward plant locations near the market areas. This, in fact, has been part of the reasoning behind steel development in the western United States; therefore, it follows that there will be market advantages favoring further expansion of Northwest steel output (24)(31)(54).

The projections of steel ingot production were based on the demand for rolled steel products. In order to arrive at the following projections, the historical pattern as well as the



current status of the industry and the related economic and technologic factors were examined. Because of the predominant role of steel mill production compared with the regional steel castings output, the principal emphasis for defining employment is on mill products, expressed as steel ingot. The assumption was that market factors influencing steel ingot also influence steel casting production.

It was further assumed, based on the growth of steel production in California, that the production of steel in the Pacific Northwest would grow from a production-to-market relationship of 32 percent to one of 45 percent by 1985; that is, 45 percent of the steel used in the Pacific Northwest would be produced in the region.

Table 56 - Steel Production and Employment, 1960, with Projections to 1980, 2000 and 2020, Columbia-North Pacific Region

| Year | Steel Ingot | Steel Castings | Employment <sup>1/</sup> |
|------|-------------|----------------|--------------------------|
|      | Tons        | Tons           |                          |
| 1960 | 381,000     | 35,500         | 4,400                    |
| 1980 | 900,000     | 46,600         | 5,500                    |
| 2000 | 1,400,000   | 58,900         | 5,300                    |
| 2020 | 1,900,000   | 71,500         | 3,800                    |

<sup>1/</sup> Productivity increase of 2.75 percent from 1960 through 1980 and 2.25 percent after 1980.

#### Titanium

Expansion in titanium sponge production is expected in the next two decades (20)(54). National consumption of titanium sponge was projected to total 100,000 tons by 1985, an average annual rate of growth of about 13 percent from 1963 to 1985.

The regional industry was projected to grow until it equaled at least 40 percent of the national sponge production--approximately 40,000 tons annually. It was assumed production by 1970 would be 2,000 tons per year in the region.

Innate properties that impart desirable physical and chemical qualities to paint pigments also provide a heavy demand for another titanium product--titanium dioxide. Some of the same properties that make it so useful in the manufacture of paint are also desired by the paper-making industry. Nationally, use of titanium pigment by the paint and paper-making industries accounts for about 72 percent of the total of titanium pigment

consumed. The Bureau of Mines estimated that consumption of  $TiO_2$  in the west (Rocky Mountain and Pacific States) in 1958 was 31,600 tons, of which 66 percent (21,000 tons) was used in making paint. A rough estimate of consumption by 1962 showed that growth in Western States had furnished a market for 45,000 to 50,000 tons of titanium dioxide.

Projections of titanium dioxide productive capacity for the Northwest are shown in table 57.

Table 57 - Projected Titanium and Titanium Dioxide Production and Employment, Columbia-North Pacific Region, 1970, 1980, 2000 and 2020

| Year | Titanium Dioxide (Tons) | Employment <sup>1/</sup> | Titanium Sponge (Tons) | Employment <sup>2/</sup> |
|------|-------------------------|--------------------------|------------------------|--------------------------|
| 1970 | 10,000                  | 125                      | 2,000                  | 300                      |
| 1980 | 20,000                  | 250                      | 20,000                 | 1,200                    |
| 2000 | 45,000                  | 560                      | 60,000                 | 2,400                    |
| 2020 | 50,000                  | 625                      | 66,000                 | 2,640                    |

<sup>1/</sup> Eight tons per employee.

<sup>2/</sup> Productivity changes from 6.6 in 1970 to 25 tons per employee in 2020.

Source: Fulkerson, Frank B., and Jerry J. Gray, The Titanium Industries and Their Relation to the Pacific Northwest, report prepared for Bonneville Power Administration, Portland, Oregon, 1965.

The figures shown in table 57 do not contain productivity gains in the titanium dioxide figures because that particular industry was considered to be a mature industry and any further drastic changes in technology would be considered unlikely.

In the past, the titanium metal reduction process has required 0.15 persons per annual ton. Considering that titanium reduction is a young industry and the earlier stages of a new industry enjoy a rather large increase in productivity in the first decade or so, a ratio of 0.15 persons per annual ton of production was used to establish total employment in 1970, but by the year 1980 the ratio was changed to 0.06, and by 2000 and beyond the ratio 0.04 was used.

### Magnesium

Historically, magnesium ingot consumption has been outside the area due to concentration in the Midwest of aluminum rolling mills and extruding foundries where magnesium is used as an alloy (19).

National consumption of primary magnesium was estimated to reach 350,000 tons by 1985, three times the current domestic capacity. This was mainly based on continued expansion that has been projected in the aluminum industry. Factors that would lead to production of magnesium in the Columbia-North Pacific Region would have to be classified as changes in the industry. If more competition develops from domestic and foreign sources the price of magnesium may possibly drop, which would encourage consumption. In addition to price, other factors, such as greater consumer acceptance, growth of the economy, and the development of new uses, eventually should cause greater consumption of magnesium.

There are now no magnesium plants in the region; by 1970 one is projected to begin producing 15,000 tons annually. The assumption for this was that certain of the forthcoming increases in national magnesium plant capacity would be placed in the Columbia-North Pacific Region. The Pacific Northwest is considered to represent approximately 12 percent of the national market.

Magnesium production in the region with growth through 2020 is shown in table 58.

Table 58 - Projected Magnesium Production and Employment, Columbia-North Pacific Region, 1970, 1980, 2000 and 2020

| Year | Tonnages | Employment |
|------|----------|------------|
| 1970 | 15,000   | 375        |
| 1980 | 60,000   | 1,800      |
| 2000 | 155,000  | 3,000      |
| 2020 | 175,000  | 3,000      |

Production beyond 1985 was assumed to level off gradually at a steadily decreasing rate. The rates of growth between the periods 1970-80, 1980-2000, and 2000-2020 were assigned the following average annual growth rates: 1970-80, 15 percent; 1980-2000, 4.75 percent; 2000-2020, 0.75 percent.

### Aluminum

Aluminum production in the Pacific Northwest has a very high potential for growth and stability (9) (17). Conditions for the expansion of the regional aluminum industry have been favorable; increased investments in existing plants and equipment and the entrance of new firms into the area substantiate this. The aluminum capacity of plants in the Pacific Northwest in 1965 was 802,500 tons (table 59).

By 1972 the capacity currently in the early construction or advanced planning stage should be in place; at that time the area's rated capacity should approach 1.5 million tons. The unprecedented expansion of the regional aluminum industry certainly is not without justification. Comparative cost is one of the important conditions in this expansion; the other is the growth of aluminum use by consuming industries in the western states, export markets, and the nation as a whole. In studies by the Bureau of Mines and the recently published aluminum report done for Bonneville Power Administration by Ivan Bloch and Associates (9), comparative costs indicated that regional plants will continue to compete effectively with those in the Ohio Valley.

Forecasts indicate national aluminum consumption could exceed 8.0 million tons by 1975 (9). This is twice that of the 1965 level, or an average annual growth rate of 8 percent -- the historical national rate for the industry. The 1965 capacity in the Pacific Northwest was 802,500 tons. Using an average annual growth rate of 8 percent would result in a 1975 capacity of 1.7 million tons. If the Pacific Northwest maintained the 31 percent national capacity, rated capacity would reach a 1975 level of 2.6 million tons. An average measure of these two figures, or the midpoint of the range, would be the more likely possibility -- 2.2 million tons by 1975. This is an average annual growth rate of between 10 and 11 percent. The further expansion of the aluminum industry in the Pacific Northwest is not expected to continue at that rate; the period from 1975 to 2020 will experience a growth rate below the national historical rate of 8 percent. Assuming the increase in the next decade would result in a 1980 capacity figure of 2.8 million tons and a 1985 capacity figure of 3.8 million tons (9), an average annual rate between 5 and 6 percent would be required. A study by Resources for the Future, Inc., in the publication, Resources in America's Future, Patterns of Requirements and Availabilities, 1960-2000, shows an average growth rate of 5.375 percent for the high projection of primary aluminum requirements between 1980 and 2000.



Table 59 - Primary Aluminum Ingot Capacity, by Company and Location, Columbia-North Pacific Region and United States, 1965 and 1972

| Company and Location             | 1965<br>(tons) | Percent of     |                                       | 1972<br>(tons) | Subregion | Percent of<br>Region in<br>1972 |
|----------------------------------|----------------|----------------|---------------------------------------|----------------|-----------|---------------------------------|
|                                  |                | Region in 1965 | Under<br>construction<br>or scheduled |                |           |                                 |
| Aluminum Company of America      |                |                |                                       |                |           |                                 |
| Vancouver, Washington            | 100,000        | 12.5           | -                                     | 100,000        | 8         | 6.7                             |
| Wenatchee, Washington            | 125,000        | 15.6           | 50,000                                | 175,000        | 2         | 11.8                            |
| Reynolds Metals Co.              |                |                |                                       |                |           |                                 |
| Longview, Washington             | 65,000         | 8.1            | 120,000                               | 185,000        | 8         | 12.4                            |
| Troutdale, Oregon                | 91,500         | 11.4           | 40,000                                | 131,500        | 9         | 8.8                             |
| Kaiser Aluminum & Chemical Corp. |                |                |                                       |                |           |                                 |
| Mead, Washington                 | 193,000        | 24.0           | -                                     | 193,000        | 1         | 13.0                            |
| Tacoma, Washington               | 41,000         | 5.1            | 41,000                                | 82,000         | 11        | 5.5                             |
| Anaconda Aluminum Co.            |                |                |                                       |                |           |                                 |
| Columbia Falls, Montana          | 100,000        | 12.5           | 75,000                                | 175,000        | 1         | 11.8                            |
| Intalco Aluminum Corp.           |                |                |                                       |                |           |                                 |
| Bellingham, Washington           | -              | -              | 228,000                               | 228,000        | 11        | 15.3                            |
| Harvey Aluminum Co.              |                |                |                                       |                |           |                                 |
| The Dalles, Oregon               | 87,000         | 10.8           | -                                     | 87,000         | 7         | 5.9                             |
| Northwest Aluminum Co.           |                |                |                                       |                |           |                                 |
| Warrenton, Oregon                | -              | -              | 130,000                               | 130,000        | 10        | 8.7                             |
| Pacific Northwest Total          | 802,500        |                | 684,000                               | 1,486,500      |           |                                 |
| United States total              | 2,772,000      |                |                                       |                |           |                                 |
| Percent of U.S. Total            | 29             |                |                                       |                |           |                                 |



A more conservative estimate of 4 percent average annual growth from 1985 to 2000 and 2.5 percent from 2000 to 2020 would result in the following capacity figures for reduction plants in the Columbia-North Pacific Region: 1985, 3.8 million tons, 2000, 6.8 million tons; 2020, 11.0 million tons.

Employment as a function of production is a compromise between the employment by reduction plants as a direct ratio with production and the influence of a nominal gain in productivity. Projections of employment to the years 2000 and 2020 (table 60) are based on the gain in capacity less an estimated increased average annual productivity assumed to be between 2.5 and 3.0 percent.

Table 60 - Primary Aluminum Industry, Capacity and Employment, 1965, Pacific Northwest, with Projections to 1980, 1985, 2000, and 2020.

| <u>Year</u> | <u>Capacity<br/>(tons)</u> | <u>Employment</u> |
|-------------|----------------------------|-------------------|
| 1965        | 802,500                    | 9,100             |
| 1980        | 2,800,000                  | 17,100            |
| 1985        | 3,800,000                  | 21,100            |
| 2000        | 6,800,000                  | 25,000            |
| 2020        | 11,000,000                 | 25,000            |

Source: Bloch, Ivan, and Samuel Moment. The Aluminum Industry of the Pacific Northwest, report prepared by Ivan Bloch and Associates for Bonneville Power Administration, Portland, Oregon, 1967

The breakdown of direct employment in the regional aluminum industry into the subregions is shown in table 61. The allocation of workers up through 1975 was made using percentages of total employment that were equal to the percentage of installed capacity in each subregion. Beyond 1975, the assumption was made that the future expansion of the industry would most likely occur in those subregions with access to waterborne delivery of alumina by deep-draft freighter. For instance, the total share of employment in Subregions 8, 9, 10, and 11 increased from 37 percent in 1965 to 64 percent in 2020.

Table 61 - Employment in the Aluminum Industry, 1965, with Projections for  
1980, 2000, and 2020, Columbia-North Pacific Region and Subregions

| Year | Total<br>capacity<br>(short tons) | Columbia |         | Employment 1/<br>Subregions |       |       |       |       |       |       |
|------|-----------------------------------|----------|---------|-----------------------------|-------|-------|-------|-------|-------|-------|
|      |                                   | North    | Pacific | 1                           | 2     | 7     | 8     | 9     | 10    | 11    |
| 1965 | 802,500                           | 9,100    |         | 3,300                       | 1,400 | 1,000 | 1,850 | 1,050 | -     | 500   |
| 1980 | 2,800,000                         | 17,100   |         | 4,000                       | 2,000 | 1,000 | 3,200 | 1,690 | 1,670 | 3,540 |
| 2000 | 6,800,000                         |          | 25,000  | 5,000                       | 2,500 | 1,500 | 5,000 | 3,000 | 4,000 | 4,000 |
| 2020 | 11,000,000                        |          | 25,000  | 5,000                       | 2,500 | 1,500 | 5,000 | 3,000 | 4,000 | 4,000 |

1/ From table 60; subregional employment allocated on basis of capacity

### Subregion Projections for Major Commodities

Projections for the primary metals industries discussed in the previous pages have been presented on an industry basis. Table 62 shows the projected employment for each commodity allocated to the appropriate subregions (whenever confidentiality permits) which were assumed to be the locale for future growth.

Table 62 - Projected Employment for Major Commodities  
by Subregion, 1980, 2000 and 2020

| Commodity          | Subregion   | 1980   | 2000   | 2020   |
|--------------------|-------------|--------|--------|--------|
| Copper, lead, zinc | 1           | 1,773  | 1,220  | 845    |
|                    | 11          | 667    | 500    | 375    |
|                    | Total       | 2,440  | 1,720  | 1,220  |
| Ferroalloys        | <u>1/</u>   | 750    | 425    | 350    |
| Steel              | 8           | 170    | 150    | 130    |
|                    | 9           | 1,770  | 1,940  | 1,830  |
|                    | 11          | 3,560  | 3,210  | 1,840  |
|                    | Total       | 5,500  | 5,300  | 3,800  |
| Titanium           | 9           | 1,450  | 2,960  | 3,265  |
| Magnesium          | 9 <u>2/</u> | 1,800  | 3,000  | 3,000  |
| Aluminum           | 1           | 4,000  | 5,000  | 5,000  |
|                    | 2           | 2,000  | 2,500  | 2,500  |
|                    | 7           | 1,000  | 1,500  | 1,500  |
|                    | 8           | 3,200  | 5,000  | 5,000  |
|                    | 9           | 1,690  | 3,000  | 3,000  |
|                    | 10          | 1,670  | 4,000  | 4,000  |
|                    | 11          | 3,540  | 4,000  | 4,000  |
| Total              |             | 17,100 | 25,000 | 25,000 |
| C-NP Total         |             | 29,040 | 38,405 | 36,635 |

1/ To insure confidentiality, cannot be allocated. Subregions represented include 1, 2, 4, 8, 9, and 10.

2/ The most likely subregions besides 9 for future growth will be 7 and 8.

### Other Primary Metals Industries

Other primary metals industries include the production of primary non-ferrous shapes (rolling, drawing, extruding, casting), both ferrous and non-ferrous forgings, secondary smelting and refining of non-ferrous metals and miscellaneous minor activities. These industries comprise SIC classifications 334, 335, 336 and 339.

In 1966 these industries employed about 5,600 workers in the region (table 63). Employment has grown sharply in recent years. The annual rate of growth from 1960 through 1966 amounted to 7.0% per year (1960 estimated employment--3,750 workers).

Table 63 - Other Primary Metals Industries Employment,  
Columbia-North Pacific Region, 1966 1/

| SIC | Industry   | 1966  |
|-----|--|-------|
| 334 | Secondary smelting and refining non-ferrous metals | 209   |
| 335 | Rolling, drawing, extruding non-ferrous metals     | 3,777 |
| 336 | Non-ferrous foundries                              | 996   |
| 339 | Miscellaneous primary metals                       | 658   |
|     | Total  | 5,640 |

1/ Data estimated from state employment security agencies.

Two major factors in the location of these industries are markets and raw materials supplies. Markets are primarily in the metal products industries in population centers, and plants tend to locate near these markets. Plant locations are also influenced, however, by the location of the "basic" elements of the primary metals industry, SIC 331, 332, and 333, which supply their raw materials (ingots, billets, etc.). Their location in the region reflects these influences. Virtually all of present employment is located in Subregions 1, 8, 9 and 11 either near "basic" metals plants, such as aluminum refineries, or in the major regional population centers.

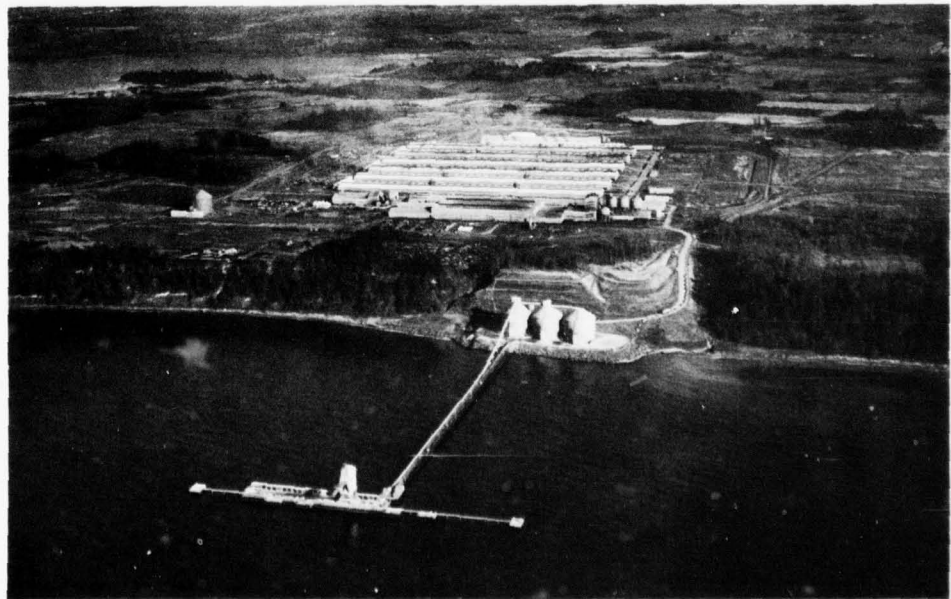
These industries are less well developed in the region than they are nationally, both in terms of their relationship

to the "basic" industries and in terms of their share of regional markets. Regional employment in 1966 amounted to about 24 percent of the whole regional primary metals industry compared with a share of about 30 percent nationally, and there were only 94 workers per 100,000 population in the region compared with 195 per 100,000 nationally.

Future growth in these industries may be expected to increasingly reflect the influence of markets and raw materials on their location. Based on this expectation, projections have been developed on the assumption that employment will tend to approach the national average relationship of employment to markets, and the national relationship of employment in these industries to the "basic" elements of the primary metals industry. Assuming that these industries will continue to represent about 30 percent of the national primary metals industries, and utilizing the national projections of the Office of Business Economics and Columbia-North Pacific projections of the "basic" elements in the region, employment is projected as follows: 1980, 10,200; 2000, 15,100; 2020, 16,400. Projections for subregions are presented in combined form in table 64.

#### Summary Projections

Projections of employment for the primary metals industry as a whole are presented in table 64. The figures include a subregion allocation of employment in ferroalloys and "other" primary metals industries as well as those shown in table 62.



*Aluminum manufacturing, Bellingham, Washington. (Galen Biery photo)*



Table 64 - Projected Employment in the Primary Metals Industries, Columbia-North Pacific Region and Subregions, 1980, 2000 and 2020

| Subregion | 1980   | 2000   | 2020   |
|-----------|--------|--------|--------|
| 1         | 8,930  | 9,275  | 8,535  |
| 2         | 2,595  | 3,245  | 3,370  |
| 3         | 70     | 190    | 240    |
| 4         | 140    | 280    | 350    |
| 5         | 75     | 225    | 300    |
| 6         | 45     | 120    | 150    |
| 7         | 1,270  | 1,960  | 2,050  |
| 8         | 4,665  | 6,730  | 6,740  |
| 9         | 9,100  | 14,770 | 15,615 |
| 10        | 2,465  | 5,290  | 5,440  |
| 11        | 9,875  | 11,410 | 10,235 |
| 12        | 10     | 10     | 10     |
| C-NP      | 39,240 | 53,505 | 53,035 |

#### OTHER MANUFACTURING INDUSTRIES

The manufacturing industries which have been treated in the earlier sections of this report comprise the water-using industries--those most significant in industrial water use in the region. They are, as a group, the largest employers and contribute a larger part of total production <sup>1/</sup> than the rest of the manufacturing industries. By coincidence, they are also the primary resource-using industries in the manufacturing group. The other manufacturing industries, less dependent on natural resources, have been later in their development, but they are now a substantial part of the manufacturing group, and the generally more rapid growth in these industries makes them increasingly important to the future economic development of the region. The "other" manufacturing industries employed about 180,000 workers in the region in 1960, and their total value added in manufacturing amounted to around \$1.3 billion. Some information on the composition and importance of this group of industries is presented in table 65.

Employment in "other" manufacturing made up about 40% of the region's manufacturing employment in 1960. As shown in the table, the transportation equipment industry accounted for nearly half the employment in the group, and printing and publishing was another large employer. Three other industries accounted for most of the remainder: fabricated metals,

<sup>1/</sup> Measured by value-added in manufacture.

Table 65 - Other Manufacturing Industries in the Columbia-North Pacific Region, 1960

| SIC                            | Industry                        | 1960<br>Employment | Percent of             |                        | Location<br>Quotient<br>(US Base) |
|--------------------------------|---------------------------------|--------------------|------------------------|------------------------|-----------------------------------|
|                                |                                 |                    | Other<br>Manufacturing | Total<br>Manufacturing |                                   |
| 22                             | Textile mills                   | 3,944              | 2.2                    | 0.9                    | .134                              |
| 23                             | Apparel                         | 7,347              | 4.1                    | 1.6                    | .203                              |
| 27                             | Printing & publishing           | 27,320             | 15.2                   | 6.1                    | .767                              |
| 34                             | Fabricated metals <sup>1/</sup> | 14,487             | 8.1                    | 3.2                    | .360                              |
| 35                             | Machinery                       | 16,029             | 8.9                    | 3.6                    | .329                              |
| 36                             | Electrical equipment            | 9,354              | 5.2                    | 2.1                    | .202                              |
| 37                             | Transportation equipment        | 81,490             | 45.3                   | 18.2                   | 1.443                             |
| 30,31,32,<br>38,39             | Undistributed industries        | 19,868             | 11.0                   | 4.4                    | .284                              |
| Total for industries<br>listed |                                 | 179,839            | 100.0                  | 40.2                   | .494                              |
| Total manufacturing            |                                 | 447,025            | --                     | 100.0                  | .822                              |

<sup>1/</sup> Includes ordinance manufacturing, SIC 19.

Source: Compiled from 1960 Census of Population by Department of Commerce, Office of Business Economics.

machinery, and the undistributed group in which the stone, clay and glass industry is most important.

While the "other" manufacturing industries represented 40% of the region's manufacturing employment, these same industries in the nation as a whole represented 67% of national manufacturing employment. The underrepresentation of these industries in the region is demonstrated by the location quotients <sup>1/</sup> shown in the last column of the table. With the exception of the transportation equipment and printing and publishing industries, none of the industries had a location quotient greater than .36; a figure signifying roughly 1/3 of average representation in terms of the total employment size of the region.

Estimates of value added in these industries has been made for the years 1958 and 1963. Table 66 shows these estimates together with the proportion that they represented of national production (value added) in each industry.

The "other manufacturing industries represented a smaller proportion of manufacturing production than they did of employment. This is mainly due to the higher value added per employee of the capital intensive paper and chemicals industries in the heavy water-using category.

Value added in each industry was generally a very small part of national production, but in almost every case it increased substantially between the two years.

A better indication of the rapid regional development of these industries in recent years is presented in table 67. This table shows how employment has been expanding since 1950. Over the sixteen years covered by the data, regional growth in the group as a whole averaged well over six percent per year compared with a national average of two and a half to three percent. Moreover, growth was not confined to only one or two of the industries, but was quite evenly distributed among them. Every industry, with the exception of printing and publishing (and textiles in the most recent period) had regional growth rates significantly higher than the national rates of increase.

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<sup>1/</sup> A location quotient is the ratio of the percent that employment in an industry in an area is of national employment in that industry to the percent that total employment in the area is to total national employment. A ratio of 1.00 indicates that the region has an average proportion of employment in that industry; a ratio less than 1.00 shows underrepresentation of that industry in the region.

Table 66 - Value Added in Other Manufacturing Industries,  
Columbia-North Pacific Region, 1958 and 1963

| SIC | Industry   | Value Added<br>(Million Dollars) |         | Percent of Industry<br>Total in US<br>(Percent) |      |
|-----|--|----------------------------------|---------|---|------|
|     |  | 1958                             | 1963    | 1958  | 1963 |
| 22  | Textile mills  | 12.3                             | 22.7    | 0.25  | 0.37 |
| 23  | Apparel  | 33.2                             | 48.4    | 0.55  | 0.61 |
| 27  | Printing and publishing                                | 133.4                            | 163.8   | 1.67  | 1.56 |
| 30  | Rubber and plastics                                    | 3.0                              | 10.3    | 0.09  | 0.22 |
| 31  | Leather and products                                   | 2.0                              | 4.6     | 0.11  | 0.22 |
| 32  | Stone, clay and glass                                  | 86.9                             | 118.8   | 1.57  | 1.69 |
| 34  | Fabricated Metals                                      | 116.3                            | 142.3   | 1.23  | 1.21 |
| 35  | Machinery, except electrical                           | 99.6                             | 148.4   | 0.80  | 0.86 |
| 36  | Electrical equipment                                   | 41.2                             | 85.6    | 0.39  | 0.50 |
| 37  | Transportation equipment                               | 665.9                            | 1,114.3 | 4.35  | 4.89 |
| 38  | Instruments, etc.                                      | 6.8                              | 15.0    | 0.24  | 0.38 |
| 39  | Miscellaneous manufacturing                            | 18.8                             | 29.1    | 0.70  | 0.82 |
|     | Total for industries listed                            | 1,219.5                          | 1,903.3 | 1.47  | 1.66 |
|     | Total manufacturing                                    | 3,716.5                          | 5,066.1 | 2.63  | 2.64 |
|     | Industries listed as percent of<br>total manufacturing | 32.8%                            | 37.6%   |   |      |

Source: 1963 Census of Manufactures, Industry Statistics. Partially estimated from other materials.

Table 67 - Employment and Growth in Other Manufacturing Industries,  
Columbia-North Pacific Region, 1950-60 and 1960-66

| SIC | Industry                           | 1950-60 Period 1/ |         |                                  | 1960-66 Period 2/ |                |                                  |
|-----|------------------------------------|-------------------|---------|----------------------------------|-------------------|----------------|----------------------------------|
|     |                                    | C-NP              | Region  | Annual Rate<br>of Growth<br>C-NP | 1960              | Region<br>1966 | Annual Rate<br>of Growth<br>C-NP |
|     |                                    |                   |         |                                  |                   |                | U.S.                             |
| 22  | Textile mills                      | 4,108             | 3,944   | -0.4                             | -2.4              | 3,100          | -1.3                             |
| 23  | Apparel                            | 4,746             | 7,347   | 4.5                              | 1.2               | 6,600          | 2.6                              |
| 27  | Printing and publishing            | 20,915            | 27,320  | 2.7                              | 3.3               | 15,600         | 2.1                              |
| 34  | Fabricated metals<br>(incl. ord.)  | 8,951             | 14,487  | 4.9                              | 4.7               | 12,900         | 3.4                              |
| 35  | Machinery                          | 9,344             | 16,029  | 5.5                              | 2.2               | 11,500         | 9.0                              |
| 36  | Electrical equipment               | 2,168             | 9,354   | 15.7                             | 6.9               | 7,100          | 10.3                             |
| 37  | Transportation equipment           | 31,421            | 81,490  | 10.0                             | 5.6               | 69,700         | 7.8                              |
|     | Industries itemized below          | 13,486            | 19,868  | 4.0                              | 1.6               | 14,500         | 3.9                              |
| 30  | Rubber, plastics                   | NA                | NA      | --                               | --                | 700            | 12.9                             |
| 31  | Leather and products               | NA                | NA      | --                               | --                | 600            | 1.7                              |
| 32  | Clay                               | NA                | NA      | --                               | --                | 8,600          | 2.6                              |
| 38  | Instruments, etc.                  | NA                | NA      | --                               | --                | 1,500          | 7.5                              |
| 39  | Miscellaneous                      | NA                | NA      | --                               | --                | 3,200          | 3.3                              |
|     | Total for all industries<br>listed | 95,139            | 179,839 | 6.6                              | 2.5               | 140,900        | 6.3                              |
|     | Total manufacturing                | 338,905           | 447,025 | 2.8                              | 2.1               | 395,200        | 3.2                              |

1/ Compiled from Censuses of Population by Office of Business Economics.

2/ Estimated from information furnished by state employment security agencies. U.S. data  
calculated from 1967 Statistical Abstract, pp. 226-8.

NA = Not available



### Developmental Influences

While special factors affecting individual industries have contributed to their growth in the region, the broad growth patterns which have characterized these industries as a group have been the result of more pervasive factors.

The prime example of a special industrial development has been that of the transportation equipment industry. This industry is dominated in the region by one aerospace manufacturer who has attained the position of principal supplier of commercial jet aircraft in the United States and much of the rest of the world. It is also an important defense industry supplier. Future growth in this industry depends largely on such factors as future company management, the federal government's decision on support for the supersonic transport and similar matters rather than on more predictable external factors.

Another example has appeared in the instruments industry where one manufacturer has become the principal national supplier of a specific kind of electronic measuring equipment. This firm again dominates its industry in the region, and its prospects depend more on the acumen of its management than on any external influences.

For other industries, however, (and to some degree for the industries mentioned above) development is heavily influenced by environmental factors--access to markets, raw materials, transportation, labor supply, etc.

The markets of these industries encompass a wide spectrum of the economy, but they are largely industrial and interregional rather than consumer and local in their composition. Information from an input-output study for the state of Washington shows, in table 68, the distribution of sales for "other" manufacturing in 1963.

The distribution is dominated by the transportation equipment industry which sells a large part of its production to governments. Excluding this industry, the distribution shows that the bulk of production goes to industry in the state and to markets (largely industrial) in the rest of the United States.

While part of the exports from the state of Washington to the rest of the United States go to adjacent states within the Columbia-North Pacific Region, a substantial part goes out of the region, particularly to California and other western states. The growth of western markets has been a significant influence on these industries. Population growth since 1940 has averaged

Table 68 - Markets for Other Manufacturing Industries,  
Washington State, 1963

| Market   | Percent of Total Sales       |  |
|--|------------------------------|--|
|  | All "Other"<br>Manufacturing | Excluding<br>Transportation<br>Equipment |
| Washington industries                          | 15.4                         | 43.1                                     |
| Personal consumption and private<br>investment | 5.7                          | 15.5                                     |
| Government                                     | 44.0                         | 5.7                                      |
| Rest of United States                          | 29.8                         | 34.2                                     |
| Foreign exports                                | 5.1                          | 1.5                                      |
| Total  | 100.0                        | 100.0                                    |

Source: Bourque, Philip J, et al, The Washington Economy: An Input-Output Study, University of Washington, 1967.

3.2% a year in the western states, and from 1950 to 1966 (excluding the war years) it averaged 3.1% a year. Growth has come nearly twice as fast as it has to the nation and industrial markets have grown even faster.

For some of these industries, especially machinery and equipment manufacturers, access to foreign markets is also important to their growth. The study referred to in table 68 (10) showed that for the state of Washington, foreign exports represented 8.2 percent of production in the transportation equipment industry, 4.2 percent in machinery and electrical equipment, and a substantial part of instruments production which was grouped in a miscellaneous category. A study for the Willamette Valley (15), the principal fraction of the Oregon economy, showed that about 14 percent of machinery and 20 percent of electrical equipment production goes abroad.

Related to the growth in markets has been a substantial reduction in transportation costs. Since 1940 costs per ton/mile for all kinds of domestic intercity freight traffic have fallen continuously relative to other costs. Taking average costs per ton/mile and deflating them by the wholesale price index for all commodities, transportation costs as shown in table 69 had fallen, by 1966, to only 62 percent of their 1940 levels.

This decline in shipping costs is uniquely important to the region as compared with other parts of the continental

Table 69 - Cost Per Ton/mile of Domestic Intercity Freight Traffic,  
United States, 1940-1966

| Year | Current Cost<br>per Ton/mile<br>(cents) | Deflated Cost <sup>1/</sup><br>per Ton/mile<br>(1940=100) |
|------|---|---|
| 1940 | 0.90                                    | 100   |
| 1945 | 1.10                                    | 91  |
| 1950 | 1.34                                    | 74  |
| 1955 | 1.35                                    | 69  |
| 1960 | 1.40                                    | 67  |
| 1966 | 1.37                                    | 62  |

<sup>1/</sup> Wholesale price index for all commodities used as deflator.  
Source: Compiled from 1968 Statistical Abstract.

United States because the region lies the farthest from the major industrial centers of the nation. Reduced shipping costs have not only widened markets but also lowered delivered raw material costs.

As the regional economy has expanded the size of its internal markets, local production has expanded. Beyond this, however, the growth of local markets has led to more efficient production by permitting economies of scale in industrial operations. With many industrial processes, costs per unit diminish markedly as the size of plant is increased. Also, with increased size of the regional economy (and with increased size of a particular industry), reduced costs for services outside the firm, the so-called external economies, develop. A broader and cheaper range of services and facilities of all kinds become available. Social overhead, in terms of government services, transportation facilities, education and research facilities, etc., is increased.

Another factor which has contributed to the recent growth of these industries has been a tendency toward the decentralization of industry. The manufacturing industries have historically been heavily concentrated in the northeastern states, but in recent years a spreading out of industry has occurred which may be partly attributable to the reduction in relative transportation costs but must also be affected by changes in marketing techniques, improvements in technology, improved labor supplies, increased mobility, and other circumstances.

Lastly, the amenities of the region have had some affect on the growth of these industries. The region is one of unquestioned scenic grandeur, and offers unusually extensive

recreational opportunities to its residents. While the more heavily populated areas have less sunshine than the highly popular Florida and California areas, the climate is mild and fairly equable. Social and cultural amenities have achieved considerable stature in recent years although it could not be argued that they surpass those of the largest population centers. There is no doubt, however, that the region stands high in any ranking by "liveability" and with the growing mobility of the population, it will attract an increasing share of migrants.

#### Future Growth

These industries will continue to expand rapidly as markets improve and as industry decentralizes. Some slowing down of growth should occur over time as regional industries approach "proportional" representation in the area.

An indication of anticipated growth in production for these industries is presented in table 70. Projections of national production by Lundberg and others in *Resources in America's Future* (36) have been converted to a 1960 base and extrapolated from 2000 to 2020 on the basis of trends over the decade 1990-2000.

Table 70 - Projections of Production, Other Manufacturing Industries, United States, 1980, 2000 and 2020

| SIC | Industry                     | Projections<br>Index Numbers 1960=100 |       |       |
|-----|------------------------------|---------------------------------------|-------|-------|
|     |                              | 1980                                  | 2000  | 2020  |
| 22  | Textile mills                | 158                                   | 244   | 388   |
| 23  | Apparel                      | 173                                   | 306   | 532   |
| 27  | Printing and publishing      | 178                                   | 285   | 440   |
| 30  | Rubber and plastics          | 139                                   | 195   | 269   |
| 31  | Leather and products         | 299                                   | 738   | 1,831 |
| 32  | Stone, clay, glass           | 213                                   | 445   | 992   |
| 34  | Fabricated metals            | 222                                   | 480   | 1,076 |
| 35  | Machinery, except electrical | 296                                   | 764   | 1,941 |
| 36  | Electrical equipment         | 264                                   | 635   | 1,512 |
| 37  | Transportation equipment     | 333                                   | 956   | 2,760 |
| 38  | Instruments, etc.            | 444                                   | 1,405 | 4,386 |
| 39  | Miscellaneous                | 162                                   | 277   | 476   |
|     | All manufacturing            | 235                                   | 543   | 1,248 |

Source: Lundberg, H.H., et al, Resources in America's Future, pp. 561ff. Adjusted here to 1960 base and extrapolated from the year 2000 to 2020 on basis of 1990-2000 trend.

Employment in the region will grow substantially, although somewhat less rapidly than production. Projections of employment for these industries are presented in table 71.

Table 71 - Employment in Other Manufacturing Industries, 1960, with Projections to 1980, 2000 and 2020, Columbia-North Pacific Region and United States

| Year | Columbia-North<br>Pacific Region | United States | Growth in C-NP as<br>% of US Growth Rate |
|------|----------------------------------|---------------|--|
| 1960 | 179,839                          | 12,744,625    | --                                       |
| 1980 | 367,731                          | 17,341,300    | 150                                      |
| 2000 | 534,622                          | 21,689,600    | 116                                      |
| 2020 | 740,690                          | 27,305,500    | 110                                      |

Source: Region projections by C-NP Economic Work Group; U.S. projections by U.S. Dept. of Commerce, Office of Business Economics, March 1968 projections.



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# NON - COMMODITY - PRODUCING INDUSTRIES

In terms of employment, the non-commodity-producing industries represent by far the largest part of the whole economy. They include all industries except agriculture, forestry, fishing, mining, and manufacturing. The non-commodity-producing industries with the exception of the construction industry do not produce physical goods but rather various kinds of services. The construction industry produces physical goods which are fixed-in-place and do not move in trade in the usual sense. The distinction between commodity producing and non-commodity-producing industries is primarily one of convenience for economic study purposes since the non-commodity-producing industries do not rely much on the resources of an area and the market for their products (services) is confined primarily to the regional economy. They are often called the "residential" industries because they are so closely tied to the local economy. They are also relatively low consumptive users of water resources.

## CHARACTER OF THE NON-COMMODITY-PRODUCING INDUSTRIES

The non-commodity-producing industries of the region were 68 percent of total employment in 1960, a slightly higher proportion than the 65 percent that they represented nationally. There are six major industrial groups in the non-commodity-producing industries of which trade and services are the most important. The relative importance of these groups in the region and the nation is shown below:

| <u>Industry</u>                              | <u>Region</u> | <u>United States</u> |
|--|---------------|----------------------|
| Contract construction                        | 9.6%          | 9.2%                 |
| Transportation, communication, and utilities | 11.3          | 10.8                 |
| Wholesale and retail trade                   | 29.0          | 28.6                 |
| Finance, insurance, and real estate          | 5.9           | 6.6                  |
| Services                                     | 32.3          | 32.8                 |
| Public administration and armed forces       | 11.9          | 11.9                 |
| All non-commodity-producing industries       | 100.0         | 100.0                |

Table 72 shows the distribution of employment in greater detail. It also shows the location quotients for industries in the region as related to the national composition of industry.

Table 72 - Detailed Distribution of Employment in the Non-commodity-producing Industries,  
Columbia-North Pacific Region and United States, 1960

| Industry                                   | Employment |            | Percent of Non-commodity Industries |       | Location Quotient for C-NP Region |
|--|------------|------------|-------------------------------------|-------|-----------------------------------|
|  | C-NP       | U.S.       | C-NP                                | U.S.  |                                   |
| All non-commodity-producing industries     | 1,352,875  | 42,983,462 | 100.0                               | 100.0 | 1.06                              |
| Contract Construction                      | 129,460    | 3,968,253  | 9.6                                 | 9.2   | 1.09                              |
| Transportation, Communications & Utilities | 153,571    | 4,650,643  | 11.4                                | 10.8  | 1.11                              |
| Transportation                             | 98,154     | 2,859,973  | 7.3                                 | 6.6   | 1.15                              |
| Railroads                                  | 35,786     | 979,544    | 2.6                                 | 2.3   | 1.23                              |
| Trucking & warehousing                     | 29,610     | 949,781    | 2.2                                 | 2.2   | 1.05                              |
| Other transportation                       | 32,758     | 930,648    | 2.4                                 | 2.2   | 1.18                              |
| Communication                              | 26,460     | 855,414    | 2.0                                 | 2.0   | 1.04                              |
| Utilities                                  | 28,957     | 935,256    | 2.1                                 | 2.2   | 1.04                              |
| Trade                                      | 392,179    | 12,287,854 | 29.0                                | 28.6  | 1.07                              |
| Wholesale Trade                            | 82,813     | 2,311,319  | 6.1                                 | 5.4   | 1.20                              |
| Retail Trade                               | 309,366    | 9,976,535  | 22.9                                | 23.2  | 1.04                              |
| Eating & drinking                          | 63,498     | 1,878,561  | 4.7                                 | 4.4   | 1.13                              |
| Other retail                               | 245,868    | 8,097,974  | 18.2                                | 18.8  | 1.01                              |
| Finance, Insurance & Real Estate           | 79,937     | 2,820,517  | 5.9                                 | 6.6   | .95                               |
| Services                                   | 436,369    | 14,123,667 | 32.3                                | 32.9  | 1.04                              |
| Hotels, Lodgings                           | 59,986     | 2,026,448  | 4.4                                 | 4.7   | .99                               |
| Business & Repair                          | 49,185     | 1,682,922  | 3.6                                 | 3.9   | .98                               |
| Entertainment & Recreation                 | 14,982     | 525,543    | 1.1                                 | 1.2   | .96                               |
| Medical, Professional                      | 259,688    | 7,896,155  | 19.2                                | 18.4  | 1.10                              |
| Private Households                         | 52,527     | 1,992,599  | 3.9                                 | 4.6   | .88                               |
| Public Administration                      | 98,861     | 3,341,911  | 7.3                                 | 7.8   | .99                               |
| Armed Forces                               | 62,498     | 1,790,617  | 4.6                                 | 4.2   | 1.17                              |

Source: Compiled from Census of Population by Office of Business Economics.

As previously noted, the composition of these industries in the region differs in some respects from that of the nation but in general is quite similar. The amount of construction employment is influenced to a degree by the volume of dam construction and other water resource development work in the region. The proportion of construction employment in heavy construction (dam building, highways, waterworks, etc.) is 50 percent greater in the region than in the nation.

The region also has a significantly larger proportion of its employment in transportation, communication and utilities. The transportation industry accounts for most of this difference. The greater relative size of the transportation industry appears to be related to the greater distances and sparser population. Railroad employment is relatively heavy in the sparsely populated Subregions 1 and 4. The extent of waterborne commerce also contributes to the proportion of the transportation industry in the region.

The proportion of employment in the trade industries corresponds quite closely with the national average. However, wholesale trade is somewhat more important to the region.

The finance, insurance and real estate industries are slightly underrepresented in the region. Two elements of this group, finance and insurance, are not very strongly regionally oriented. The finance industry tends to be concentrated in the two principal financial centers, New York and San Francisco, and the insurance industry, while less concentrated, is not evenly distributed. The region has a number of insurance companies headquartered here but operating in all parts of the west and the United States.

The services industries represent a very broad range of activities and are the largest group among the non-commodity-producing industries. Overall representation of these industries in the region is fairly close to the national average, and although the region has a smaller proportion of its employment in lodgings, business and repair services and private households, it has a higher proportion in the medical and professional services.

Regional employment in public administration is almost precisely the same proportion of total regional employment as the national average as shown by its location quotient. The armed forces, however, are strongly represented.

The non-commodity-producing industries, when considered at the regional level, are much more evenly distributed than they are among the local areas. Table 73 shows by means of location



Table 73 - Location Quotients for Non-commodity-producing Industries,  
Columbia-North Pacific Region and Subregions, 1960 <sup>1/</sup>

| Item   | C-NP<br>Region | Subregions |      |      |      |      |      |      |      |      |     |      |     |
|--|----------------|------------|------|------|------|------|------|------|------|------|-----|------|-----|
|  |                | 1          | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10  | 11   | 12  |
| Total Employment in Subregion as Percent<br>Region Total | 100.0          | 11.7       | 3.8  | 3.5  | 5.4  | 4.8  | 3.8  | 4.4  | 4.5  | 20.7 | 6.9 | 30.1 | 0.4 |
| Location Quotients (C-NP Region Base)                    |                |            |      |      |      |      |      |      |      |      |     |      |     |
| All Non-commodity-producing Industries                   | 1.00           | 1.06       | .98  | .90  | .98  | 1.00 | .93  | .96  | .83  | 1.05 | .84 | 1.03 | .74 |
| Contract Construction                                    | 1.00           | .92        | 1.51 | 1.19 | 1.05 | 1.23 | .83  | 1.19 | .97  | 1.00 | .84 | .94  | .82 |
| Transportation   | 1.00           | 1.14       | .82  | .80  | 1.33 | .78  | .78  | .95  | 1.03 | 1.10 | .75 | .99  | .37 |
| Communications and Utilities                             | 1.00           | 1.05       | 1.41 | .93  | 1.03 | 1.17 | .62  | .92  | .86  | 1.12 | .91 | .92  | .81 |
| Wholesale Trade  | 1.00           | 1.01       | .95  | 1.09 | 1.15 | .95  | .65  | .77  | .50  | 1.26 | .59 | 1.00 | .37 |
| Retail Trade   | 1.00           | 1.10       | .90  | .94  | 1.05 | 1.01 | 1.01 | 1.05 | .89  | 1.05 | .98 | .95  | .79 |
| Finance, Insurance and Real Estate                       | 1.00           | .98        | .63  | .66  | .74  | .89  | .60  | .63  | .61  | 1.21 | .68 | 1.19 | .50 |
| Services   | 1.00           | 1.08       | .85  | .90  | .97  | .92  | 1.24 | 1.03 | .91  | 1.10 | .91 | .96  | .83 |
| Public Administration                                    | 1.00           | 1.01       | .97  | .76  | .87  | 1.06 | .71  | 1.01 | .82  | 1.05 | .77 | 1.10 | .91 |
| Armed Forces   | 1.00           | 1.21       | 1.58 | .46  | .14  | 1.26 | .15  | .09  | .07  | .16  | .44 | 1.96 | .88 |

<sup>1/</sup> Prepared from data compiled from 1960 Census of Population by Office of Business Economics.



quotients how the distribution of these industries varies within subregions. These location quotients are based on the regional distribution; that is, an industry in a subregion with its employment the same proportion of total employment in the subregion as the regional industry's share of total regional employment, has a location quotient of 1.00. The first line of the table shows total employment in each subregion as a percentage of the regional total. In general, this table shows that most of these industries show some tendency to be concentrated in the major metropolitan centers which include Subregions 1, 9, and 11.

The tendency toward local agglomeration is particularly strong for wholesale trade, finance, insurance and real estate and public administration. The distributions for several industries, however, do not correspond well with this pattern. Reasons for the different distributions in contract construction and transportation were discussed above. The distributions for communication and utilities, and services may be explained by the location in outlying areas of special power facilities in the first case and a nuclear research facility in the second. The armed forces distribution, of course, represents the location of military bases. The distribution of retail trade cannot be fully explained. The distribution as it differs from a normal metropolitan agglomeration pattern, however, appears to be affected by the remoteness of a subregion from population centers.

Somewhat similar geographic patterns are shown in table 74 which presents sales volumes for wholesale and retail trade and selected services for the years 1958 and 1963. Density indexes (in terms of sales per capita) in this table show that for wholesale trade, per capita sales are greatest in Subregions 9 and 11, while per capita retail sales are much more evenly distributed. Gross income of selected services shows a fairly strong tendency to concentration in metropolitan areas. The high density index for selected services in Subregion 4 is attributable to the large atomic research facilities in the subregion.

#### FORCES OF CHANGE

As this nation's technology has advanced it has become possible to produce more and more with less and less employment in the commodity-producing industries. In consequence, an increasingly large proportion of the labor force in the economy has been made available for the activities of the non-commodity-producing industries. Since 1940 national growth in every one

Table 74 - Sales of Wholesale, Retail, and Selected Services Establishments,  
Columbia-North Pacific Region and Subregions, 1958 and 1963

| Subregion | Wholesale Trade<br>(Sales) |                            |                     | Retail Trade<br>(Sales)    |                            |                     | Selected Services 1/<br>(Gross Income) |                            |  |
|-----------|----------------------------|----------------------------|---------------------|----------------------------|----------------------------|---------------------|--|----------------------------|--|
|           | 1958<br>(Thousand Dollars) | 1963<br>(Thousand Dollars) | 1963                | 1958<br>(Thousand Dollars) | 1963<br>(Thousand Dollars) | 1963                | 1958<br>(Thousand Dollars)             | 1963<br>(Thousand Dollars) |  |
|           |                            |                            | Density<br>Index 3/ |                            |                            | Density<br>Index 2/ |  |                            |  |
| 1         | 767,639                    | 762,568                    | .72                 | 680,984                    | 735,680                    | .93                 | 80,027                                 | 96,716                     |  |
| 2         | 264,543                    | 314,130                    | .85                 | 232,792                    | 267,912                    | .98                 | 22,129                                 | 25,353                     |  |
| 3         | 243,986                    | 263,639                    | .61                 | 265,609                    | 311,942                    | .97                 | 26,525                                 | 34,421                     |  |
| 4         | 335,436                    | 362,169                    | .67                 | 347,559                    | 416,254                    | 1.03                | 37,747                                 | 68,967                     |  |
| 5         | 291,094                    | 354,099                    | .73                 | 310,290                    | 355,963                    | .99                 | 34,503                                 | 42,375                     |  |
| 6         | 136,014                    | 171,561                    | .57                 | 183,585                    | 208,119                    | .94                 | 16,408                                 | 19,283                     |  |
| 7         | 192,241                    | 250,513                    | .65                 | 252,808                    | 306,437                    | 1.08                | 22,744                                 | 26,452                     |  |
| 8         | 117,952                    | 128,688                    | .30                 | 219,211                    | 275,672                    | .86                 | 17,630                                 | 23,165                     |  |
| 9         | 2,779,362                  | 3,870,220                  | 1.65                | 1,424,175                  | 1,823,296                  | 1.04                | 205,429                                | 275,222                    |  |
| 10        | 283,153                    | 335,339                    | .46                 | 424,986                    | 27,900                     | .97                 | 45,511                                 | 61,053                     |  |
| 11        | 2,994,340                  | 3,708,541                  | 1.08                | 2,145,771                  | 2,598,449                  | 1.02                | 301,503                                | 376,535                    |  |
| 12        | 4,795                      | 7,602                      | .30                 | 20,793                     | 20,991                     | 1.11                | 1,678                                  | 1,729                      |  |
| C-NP      | 8,410,555                  | 10,529,609                 | 1.00                | 6,508,563                  | 7,848,615                  | 1.00                | 811,834                                | 1,051,271                  |  |

<sup>1/</sup> Selected Services covered by the Census of Business include lodgings, personal service, miscellaneous business services, repair services, amusement and recreation. The principal exclusions are medical, educational and other professional services, non-profit organizations and private households.

<sup>2/</sup> The density index shows sales volumes per capita in each subregion relative to the region-wide average. A density index of 1.00 indicates that sales in proportion to population in the subregion are equal to the region-wide average.

Source: 1963 Census of Business, vols. II, V, and VII.

of these industries except transportation has substantially exceeded the growth of the economy as a whole. Similar conditions have prevailed in the Columbia-North Pacific Region although growth has been somewhat faster than national rates. Non-commodity-producing industries in the region grew at the rate of 3.4% a year over the period 1940 through 1966 while regional employment in total grew about 2.6% a year.

In table 75 regional trends in these industries are shown for the two decades, 1940-50 and 1950-60, and the six year period from 1960 to 1966.

The table shows, in terms of employment, that these industries have generally grown considerably more rapidly than the commodity-producing industries. In the 1940-50 decade growth in almost all sectors was spurred by the war demands. Construction, transportation, and government (including military services) were particularly stimulated. Services lagged slightly due to labor force demands in other sectors. In the 1950-60 decade growth was much slower but still exhibited rates that averaged twice as great as those for the commodity-producing industries. Between 1960 and 1966 growth in the commodity-producing industries increased sharply owing to rapid growth in some of the manufacturing industries, but non-commodity growth was still higher.

Perhaps the most significant factor in the future development of the non-commodity-producing industries is the fantastic growth we are experiencing in per capita income. Since 1940 per capita income (in constant dollar terms) has grown from \$1348 to \$2325 by 1962. This was a near-doubling over those 22 years and by the year 2020, regional per capita income is expected to be more than five times greater than its 1962 level. A growing part of this increased income will be spent on various services, especially education and medical services. The demands of the business world for higher educational levels will increase prodigiously as the economy becomes more advanced, but also individual demand for non-business-related education will increase as financial capability increases. The expansion in medical services is also expected to continue without abatement as health improvement becomes more feasible. Other professional and business-related services are also anticipated to advance rapidly in accordance with the expanding needs of a richer society.

Higher income levels will undoubtedly encourage a great deal more travel and the outstanding recreational opportunities of the Columbia-North Pacific Region should encourage more than its share of this development.

Table 75 - Historical Employment Trends in the Non-commodity-producing Industries,  
Columbia-North Pacific Region, 1940-50, 1950-60, 1960-66

| Item   | Census of Population Data <sup>1/</sup> |           |           |           | Annual Growth Rate |         |           | Employment Security Data <sup>2/</sup> |      | Growth Rate<br>1960-66 |
|--|---|-----------|-----------|-----------|--------------------|---------|-----------|--|------|------------------------|
|  | 1940                                    | 1950      | 1960      | 1960      | 1940-50            | 1950-60 | 1960      | 1960                                   | 1966 |                        |
| Non-commodity-producing Industries           | 708,860                                 | 1,148,419 | 1,352,874 | 1,352,874 | 4.9                | 1.7     | 1,102,410 | 1,358,900                              | 3.6  |                        |
| Contract Construction                        | 67,915                                  | 132,391   | 129,460   | 129,460   | 6.9                | -0.2    | 82,060    | 100,180                                | 3.4  |                        |
| Transportation, Communications & Utilities   | 97,226                                  | 153,366   | 153,571   | 153,571   | 4.7                | 0.0     | 123,020   | 129,010                                | 0.8  |                        |
| Trade  | 224,972                                 | 344,701   | 392,179   | 392,179   | 4.4                | 1.3     | 339,680   | 410,040                                | 3.2  |                        |
| Finance, Insurance & Real Estate             | 37,085                                  | 58,132    | 79,937    | 79,937    | 4.6                | 3.2     | 66,090    | 85,440                                 | 4.4  |                        |
| Services                                     | 221,518                                 | 317,694   | 436,368   | 436,368   | 3.7                | 3.2     | 190,200   | 252,910                                | 4.9  |                        |
| Government                                   | 60,144                                  | 142,135   | 161,359   | 161,359   | 9.0                | 1.3     | 301,360   | 381,320                                | 4.0  |                        |
| Commodity-producing Industries <sup>3/</sup> | 486,237                                 | 578,953   | 625,881   | 625,881   | 1.8                | 0.8     | 405,300   | 487,780                                | 3.2  |                        |
| Total Employment                             | 1,192,097                               | 1,727,372 | 1,987,756 | 1,987,756 | 3.8                | 1.4     | 1,507,710 | 1,846,680                              | 3.4  |                        |

<sup>1/</sup> All employment including military as of late March for respective years. Government employment classified by industry activity.

<sup>2/</sup> Annual average wage and salary employment. Excludes self-employed and military. Employment in government establishments all classified in government category. Estimates developed from data supplied by state employment security agencies.

<sup>3/</sup> Includes agriculture, fishing, forestry, mining and manufacturing.

Source: Compiled from Censuses of Population by Office of Business Economics.



While transportation needs will increase with greater travel and more commodity movements, transportation employment is not anticipated to grow very much because of productivity gains in the industry. On the other hand, communications employment will probably grow with the burgeoning demands for timelier and more extensive communications. Finance and insurance will probably continue to grow at above average rates in comparison with the rest of the economy and probably the regional share of this growth will be greater than the national average. As communications improve, local access to financial markets will permit more localization of financial institutions to better serve local needs.

Federal government services are expected to decline relative to population increases in future years, however, rapidly growing state and local governments will tend to offset any Federal employment reductions.

#### PROJECTIONS OF EMPLOYMENT

As these industries continue their rapid expansion they will become an increasingly large proportion of total employment in the region. Projections of employment for all of these industries combined are shown in table 76.

Table 76 - Non-commodity Employment, 1960, with Projections to 1980, 2000, and 2020, Columbia-North Pacific Region and Subregion

| Subregions | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|------------|--------------------|-----------|-----------|-----------|
| 1          | 140,704            | 210,628   | 291,781   | 388,557   |
| 2          | 47,289             | 73,188    | 107,096   | 144,929   |
| 3          | 48,739             | 69,798    | 98,305    | 133,896   |
| 4          | 65,399             | 98,770    | 140,047   | 190,721   |
| 5          | 64,220             | 101,280   | 143,369   | 192,479   |
| 6          | 35,288             | 51,626    | 69,343    | 89,754    |
| 7          | 47,724             | 70,343    | 94,650    | 122,663   |
| 8          | 44,060             | 65,849    | 89,760    | 117,966   |
| 9          | 309,900            | 502,960   | 728,365   | 1,005,332 |
| 10         | 75,893             | 109,918   | 145,035   | 184,795   |
| 11         | 470,847            | 722,832   | 1,020,164 | 1,382,597 |
| 12         | 2,811              | 3,321     | 3,461     | 3,781     |
| C-NP       | 1,352,874          | 2,080,513 | 2,931,376 | 3,957,470 |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics Data.



While projected employment figures are not presented for the individual industries, some indication of the changing composition of these industries is shown in table 77.

Table 77 - Projected Percentage Distribution of Employment in Non-commodity-producing Industries, Columbia-North Pacific Region, 1960 and 2020

| <u>Industry</u>                           | <u>1960</u> | <u>2020</u> |
|---|-------------|-------------|
| Construction                              | 9.6         | 8.2         |
| Transportation, Communication & Utilities | 11.3        | 4.6         |
| Trade                                     | 29.0        | 21.9        |
| Finance, Insurance & Real Estate          | 5.9         | 6.4         |
| Services                                  | 32.3        | 48.5        |
| Government                                | 11.9        | 10.3        |
| Total Non-commodity-producing Industries  | 100.0       | 100.0       |

Source: Adapted from Department of Commerce, Office of Business Economics, January 1969 Projections.

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## PROJECTIONS

### POPULATION

In 1900 the population of the Columbia-North Pacific Region was slightly under 1.2 million (table 78). Between 1900 and 1940 the population trebled, and by 1965 it was nearly 5.9 million. Between 1940 and 1950 the population increase was 33 percent and, over the next decade, 18 percent as compared with national population increases of 14 percent and 19 percent for those two decades (figure 7). Between 1940 and 1960 the annual rate of growth was 2.2 percent for the region and 1.6 percent for the nation.

Population growth from 1940 to 1960 varied considerably between the 12 study subregions (table 78). The Puget Sound Subregion had the highest growth rate, 2.75 percent, and the Closed Basin the lowest, 0.56 percent.

Population densities vary from about 144 persons per square mile in the Puget Sound Subregion to only .8 person per square mile in the Closed Basin. The population of the region, like that of the nation, is becoming more concentrated in the urbanized areas. Whereas 23 percent of the region's population was classified as rural farm in 1940, only eight percent was so classified in 1960. Between 1940 and 1960 the population in the Coastal, Puget Sound, and Willamette Subregions increased from 56 to 61 percent of the total regional population.

The future growth in population is dependent upon the economic development of the region, and is projected to increase from 5.9 million in 1965 to 12.7 million in 2020 (table 78). At the same time, the nation's population is expected to increase from 194 million in 1965 to 398 million in 2020. These projections are an increase of 115 percent for the region, compared to 105 percent for the nation (figure 7).

As in the past, there will be differences in the population growth rates of the subregions. Those subregions which are projected to have annual rates of growth significantly greater than that of the region are the Willamette and the Puget Sound. The Closed Basin is expected to continue to have the lowest annual rate of growth.

By 2020, about 66 percent of the region's population is projected to be located in the Coastal, Puget Sound, and

Table 78 - Population, 1900-1965, with Projections to 1980, 2000, and 2020,  
United States, Columbia-North Pacific Region and Subregions

| Subregion | Year        |         |         |         |         |         |         |         |         |         |          |
|-----------|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
|           | 1900        | 1910    | 1920    | 1930    | 1940    | 1950    | 1960    | 1965    | 1980    | 2000    | 2020     |
|           | (Thousands) |         |         |         |         |         |         |         |         |         |          |
| 1         | 180.2       | 326.1   | 361.8   | 378.0   | 417.4   | 489.4   | 563.7   | 595.1   | 699.1   | 897.1   | 1,140.4  |
| 2         | 45.9        | 109.6   | 112.6   | 112.0   | 130.1   | 157.4   | 193.6   | 198.6   | 253.0   | 334.0   | 431.3    |
| 3         | 23.2        | 68.2    | 92.4    | 106.5   | 131.3   | 209.3   | 227.6   | 236.7   | 280.7   | 355.2   | 443.7    |
| 4         | 45.6        | 109.0   | 184.4   | 187.8   | 217.8   | 242.5   | 277.2   | 302.0   | 350.9   | 450.5   | 576.0    |
| 5         | 56.0        | 106.3   | 130.9   | 136.4   | 178.3   | 215.3   | 252.4   | 268.2   | 328.7   | 430.4   | 553.5    |
| 6         | 96.1        | 131.7   | 132.8   | 130.3   | 137.3   | 148.9   | 156.0   | 163.3   | 193.5   | 234.6   | 274.3    |
| 7         | 86.6        | 123.5   | 128.8   | 130.1   | 143.2   | 184.9   | 198.7   | 210.5   | 251.4   | 321.9   | 404.4    |
| 8         | 47.2        | 87.6    | 101.2   | 139.1   | 161.3   | 214.0   | 224.5   | 240.1   | 277.9   | 349.4   | 441.3    |
| 9         | 233.3       | 416.4   | 496.3   | 609.9   | 691.2   | 992.4   | 1,168.9 | 1,338.9 | 1,727.3 | 2,397.6 | 3,237.2  |
| 10        | 89.9        | 151.1   | 172.2   | 215.8   | 235.6   | 328.8   | 381.4   | 405.5   | 465.5   | 575.4   | 708.9    |
| 11        | 264.5       | 607.2   | 772.5   | 909.9   | 1,007.1 | 1,418.4 | 1,768.1 | 1,904.1 | 2,449.7 | 3,345.3 | 4,448.1  |
| 12        | 5.4         | 8.7     | 8.0     | 10.8    | 11.7    | 12.8    | 13.9    | 13.3    | 16.3    | 18.7    | 21.3     |
| C-NP      | 1,174.0     | 2,245.3 | 2,693.9 | 3,066.4 | 3,462.3 | 4,614.0 | 5,426.1 | 5,876.1 | 7,293.9 | 9,710.1 | 12,680.3 |
|           | (Millions)  |         |         |         |         |         |         |         |         |         |          |
| U.S.      | 76.1        | 92.4    | 106.5   | 123.2   | 132.2   | 151.3   | 179.3   | 194.0   | 234.2   | 306.8   | 397.6    |

Source: 1900-1965 data estimated from Census of Population and Corps of Engineers data.

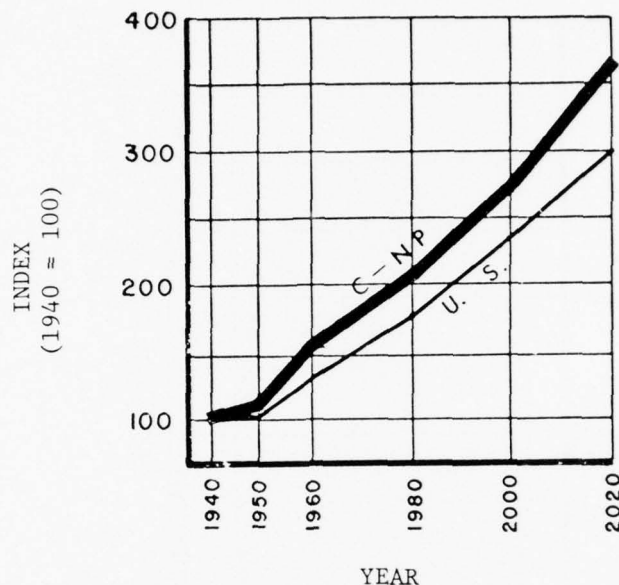


FIGURE 7. Index of Population Growth, United States and Columbia-North Pacific Region.

Willamette Subregions (figure 8). Two-thirds of the region's population will then be located in an area comprising only 18 percent of the total land area. As urbanization becomes more dominant, farm population will continue to decrease to about two percent of the total by 2020.

#### INCOME

In 1962 the sources of income in the region were wages and salaries (65 percent), proprietors (13 percent), property (13 percent), transfer payments (six percent), and other (three percent). Manufacturing is the major source of income in the form of wages and salaries, with government, services, and trade also important.

Total personal income in the region increased from \$4.6 billion in 1940 to \$13 billion in 1962, as measured in constant 1958 dollars. This increase of 180 percent over the period compares with a national increase of 144 percent, the difference being due largely to more rapid population growth. Total personal income for the region is expected to increase 4.4 percent annually during the projection period to about \$154.4 billion in 2020. This rate of growth is slightly greater than



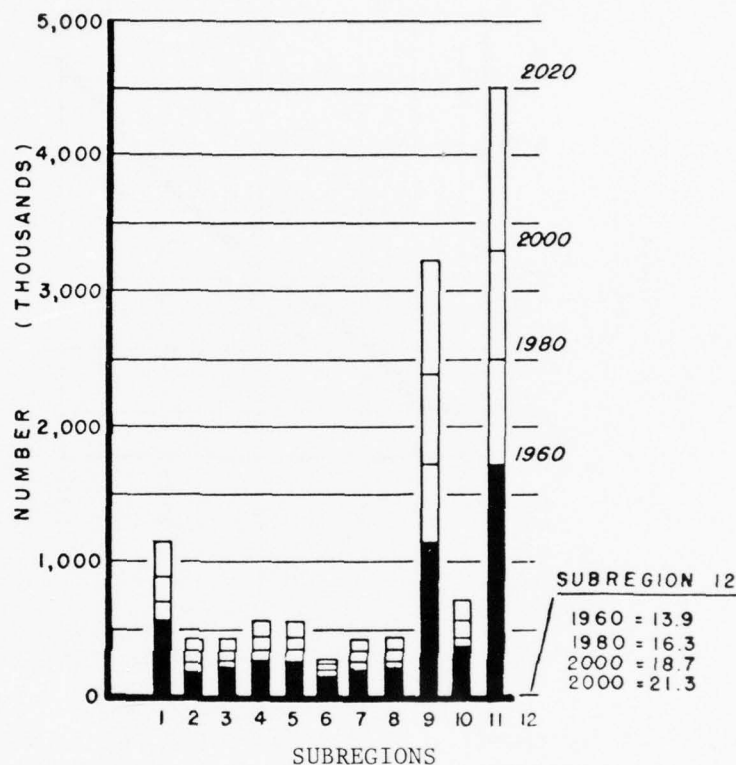


FIGURE 8. Population Growth by Subregion, Columbia-North Pacific Region.

the national rate.

In constant 1958 dollars, per capita income in the region has increased from \$1,348 in 1940 to \$2,325 in 1962, which is comparable to the national averages of \$1,300 and \$2,258 (table 79). The annual rate of growth during this period was about 2.5 percent for both the region and the nation. Per capita income is projected to be about \$12,200 in 2020, an annual growth rate of about 2.9 percent.

#### EMPLOYMENT

The rate of growth in total employment has been greater for the region than the nation (figure 9). Total employment in the region has increased from about 1.2 million in 1940 to about 2.0 million in 1960 (table 80). This has been on

Table 79 - Per Capita Income, 1940-1962, with Projections to 1980, 2000 and 2020, United States, Columbia-North Pacific Region and Subregions

| Subregion | 1940  | 1950  | 1962<br>(1958 Dollars) | 1980  | 2000  | 2020   |
|-----------|-------|-------|------------------------|-------|-------|--------|
| 1         | 1,369 | 1,795 | 2,057                  | 3,947 | 6,814 | 11,611 |
| 2         | 1,227 | 2,040 | 2,271                  | 4,112 | 7,161 | 12,411 |
| 3         | 1,213 | 1,851 | 2,230                  | 3,950 | 6,863 | 11,994 |
| 4         | 916   | 1,531 | 1,938                  | 3,468 | 6,010 | 10,517 |
| 5         | 1,102 | 1,602 | 2,080                  | 3,844 | 6,767 | 11,852 |
| 6         | 1,002 | 1,816 | 2,032                  | 3,770 | 6,629 | 11,897 |
| 7         | 1,275 | 1,996 | 2,237                  | 4,134 | 7,228 | 12,528 |
| 8         | 1,192 | 1,850 | 2,165                  | 4,012 | 7,022 | 12,287 |
| 9         | 1,417 | 1,946 | 2,328                  | 4,175 | 7,096 | 12,287 |
| 10        | 1,188 | 1,905 | 2,034                  | 3,550 | 6,258 | 10,995 |
| 11        | 1,574 | 2,093 | 2,633                  | 4,358 | 7,447 | 12,659 |
| 12        | 1,570 | 2,479 | 2,459                  | 4,243 | 7,467 | 12,878 |
| C-NP      | 1,348 | 1,929 | 2,325                  | 4,097 | 7,061 | 12,179 |
| U.S.      | 1,300 | 1,805 | 2,258                  | 4,112 | 7,161 | 12,411 |

Source: 1940-1962 data estimated from Census of Population and Office of Business Economics data.

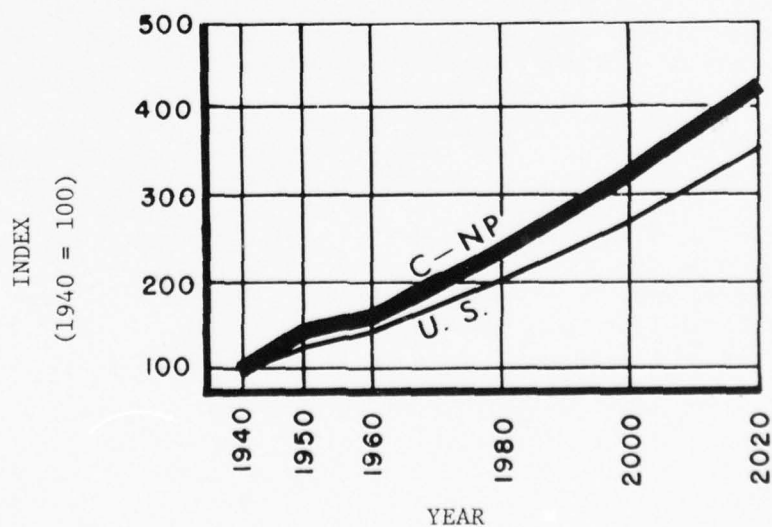


FIGURE 9. Index of Employment Growth, United States and Columbia-North Pacific Region

Table 80 - Employment 1940-1960, with Projections to 1980, 2000 and 2020, United States, Columbia-North Pacific Region and Subregions

| Subregion   | 1940  | 1950  | 1960  | 1980  | 2000  | 2020  |
|-------------|-------|-------|-------|-------|-------|-------|
| (Thousands) |       |       |       |       |       |       |
| 1           | 139   | 177   | 194   | 269   | 355   | 459   |
| 2           | 45    | 59    | 71    | 99    | 134   | 173   |
| 3           | 42    | 72    | 79    | 104   | 135   | 173   |
| 4           | 65    | 84    | 98    | 133   | 177   | 230   |
| 5           | 58    | 79    | 94    | 135   | 179   | 231   |
| 6           | 45    | 54    | 56    | 73    | 93    | 114   |
| 7           | 52    | 70    | 74    | 101   | 129   | 162   |
| 8           | 54    | 75    | 78    | 108   | 139   | 175   |
| 9           | 247   | 378   | 431   | 680   | 949   | 1,280 |
| 10          | 82    | 124   | 132   | 182   | 232   | 289   |
| 11          | 359   | 550   | 668   | 979   | 1,338 | 1,773 |
| 12          | 5     | 5     | 6     | 7     | 8     | 9     |
| C-NP        | 1,192 | 1,727 | 1,979 | 2,869 | 3,866 | 5,067 |
| (Millions)  |       |       |       |       |       |       |
| U.S.        | 45    | 57    | 66    | 93    | 123   | 159   |

Source: 1940-1960 data estimated from Census of Population and Office of Business Economics data.

an annual rate of increase of about 2.6 percent. During this same period, total employment in the nation increased at an annual rate of approximately 1.9 percent.

The annual rate of increase among industries, however, has been far from uniform. For example, employment in manufacturing has shown a relatively large increase of about 3.4 percent annually, retail trade about 2.6 percent, and professional services over five percent during this period. Agriculture and mining employment, on the other hand, exhibited substantial decreases in employment with significant increases in output. Employment in agriculture decreased by approximately 30 percent and mining 55 percent from 1940 to 1960.

In 1960, employment in the service and distributive industries accounted for approximately 63 percent of total employment, compared to about 54 percent in 1940. Manufacturing employment was about 19 percent of total employment in 1940, but increased to about 22 percent in 1960. During the same period employment in contract construction increased only about one percent relative to total employment. Agriculture employment

decreased from 18 percent of the total in 1940 to about seven percent in 1960.

Total employment for the region is estimated to increase from about 2.0 million in 1960 to 5.1 million in 2020 (table 80). Employment, like population, will tend to be concentrated in the western portion of the region. In 1960, 62 percent of all employment was located in three subregions -- Willamette, Puget Sound, and Coastal. By 2020, it is projected that 66 percent of the region's employment will be in these subregions (figure 10). Annual growth rates of employment will vary by subregion for the 1960-2020 period, ranging from 1.8 percent for the Willamette to 0.76 percent for the Closed Basin.

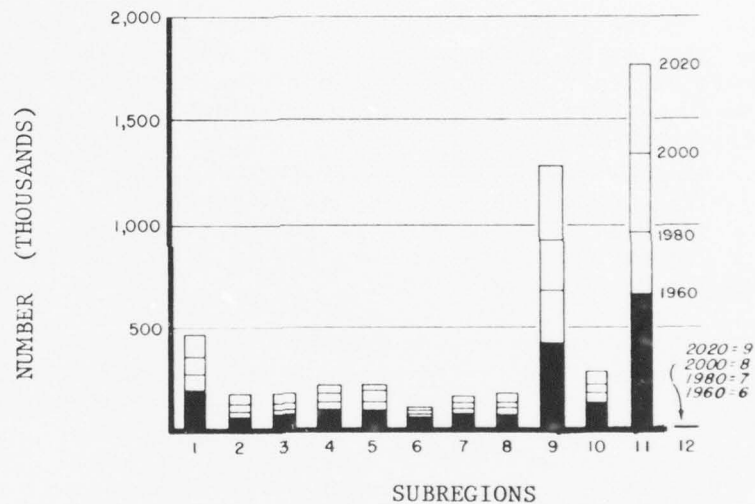


FIGURE 10. Employment Growth by Subregion, Columbia-North Pacific Region.

#### INDUSTRIES

The manufacture of forest products is the largest component of the region's manufacturing industry. In 1962, wood products employment (including pulp and paper) amounted to 154,000 workers. This was less than it had been in earlier years, but it was still nearly 35 percent of total manufacturing employment. In addition, another 17,500 workers were employed in forest management.

About three-quarters of the region's forest production comes from the Douglas-Fir area, encompassing the four

subregions lying west of the Cascades. Most of the remainder comes from Subregions 1, 4, and 7, but there is some forest production in each of the subregions.

Despite employment reduction, forest production has been expanding in recent years, and further expansion will occur. Projections, based upon consideration of the national demand for wood products and the relationship of regional supplies to those in other parts of the country, indicate that regional wood consumption by the forest industries will grow from about 3.5 billion cubic feet in 1962 to 5.3 billion in 2020. The increased timber harvest will be achieved not by enlarging the forests (forest land acreage will decrease slightly), but by more intensive forest management and better utilization of the trees.

Most of the growth in the manufacturing of forest products will be taken up by the pulp and paper industry, which will roughly treble in size. Consumption by the lumber and wood products industries is projected to be relatively unchanged, although great changes will likely take place in the types of products made and the methods of manufacture of these industries. Plywood will continue to take an increasing share of the market, and such products as fiberboard and particleboard and a broad range of user-oriented new products are replacing lumber as end products of the new industry.

Reflecting the increasing productivity of these industries, employment in lumber and wood products is projected to decline by about a third over the next 50 years, while pulp and paper, despite a threefold expansion in production, is expected to gain only a little more than 10 percent in employment. This intensification of forest management would increase employment in this category to nearly three times its 1962 level by 2020. The net result for employment in the forest industries taken together will mean a modest reduction in total employment despite the greatly expanded forest output.

Agriculture is an important industry in the region. In 1964 the value of agricultural production exceeded \$1.5 billion and over 150,000 persons were employed in agriculture. About 60 percent of the value was from crops and 40 percent from livestock and poultry. The industry utilizes a significant proportion of the region's land and water resources for producing a great variety of agricultural commodities. Of the 21 million acres of cropland, about seven million acres are irrigated. Rangeland and forest land are also utilized by the livestock industry.

Agriculture is expected to continue as an important



industry within the region in the future, with output increasing nearly 2 1/2 times by the year 2020. Increases in output by subregions will range from two to threefold by 2020. Employment, on the other hand, will decrease substantially in the region and subregions by 2020. Farm incomes may be supplemented by recreational use of farm ponds and dude ranch operations.

Anticipated increases in agricultural output will be accompanied by changes in the structure of the agricultural industry. Substitution of capital and other inputs for labor and land, as well as shifts in the organization and use of resources, will continue. Further reductions in the numbers of farms are in prospect as smaller farms are consolidated into larger commercial farms. Increased productivity per worker and per acre will result primarily from additional resource development such as irrigation and drainage, new technology, and more extensive use of capital inputs.

Parts of the region are highly mineralized and, in several localities, mining activity is an important segment of the local economy. Subregion 1 is a leading production area in the United States for copper, lead, and zinc. Phosphate mining in Subregion 4 is also significant. The total value of mineral production in the region in 1965 amounted to about \$388 million. Of this total, roughly half is derived from metals mining. Sand, gravel, and stone production, representing almost one-third of total mineral production, accounted for most of non-metallic mineral production. Phosphate, lime, and pumice were also of importance.

Regional mineral production is projected to expand in the future. A great variety of minerals is scattered throughout the region--many in large-scale deposits of economic significance--and these resources will be gradually developed in the future. Employment in the mining industry, however, is expected to decline slightly despite rising production levels.

The chemical industry of the region produces a wide range of products. The largest component of the industry in 1960 was the manufacture of plutonium at the Hanford Atomic Works. Other major components of the industry included producers of chlorine, caustic soda, elemental phosphorus and phosphate fertilizer, ammonia, paints, adhesives, and resins. Employment in the chemicals industry is projected to grow from 16,300 in 1960 to 39,300 in 2020. Petroleum refining, a relatively new industry in the region, is expected to expand substantially over the forecast period despite the absence of local petroleum reserves.

The processing of food is a major industry in the region. Some of the major activities are milk processing, grain milling

and canning and preserving of fruits, vegetables, and seafoods. In 1960, food processing employment was about 59,000, or about 13 percent of the total employment in manufacturing. Approximately 59 percent of the employment in food processing is located in the Willamette, Puget Sound, and Coastal Subregions. The primary food processing activities of these subregions are dairy products, grain milling, meat products, and canning and preserving. The Upper and Central Snake Subregions are important in the processing of dairy and meat products, sugar, and canning and preserving. Many of the commodities processed are consumed outside of the region.

Output of processed foods is projected to more than triple by 2020 for the region. Increases in output by subregions will vary from nearly two and a half to over five times the present output. Employment will decrease slightly due to increases in worker productivity.

The primary metals industry is partly engaged in processing regional mining products, but the larger part of its activities is based on imported raw materials or on local scrap metal supplies. The industry employed about 20,000 workers in 1960, mostly in steel, aluminum and copper, lead, and zinc smelting.

Prospects for future growth are favorable for virtually all elements of the industry. The steel industry, which now supplies about one-third of the regional steel market, should grow to serve an even larger part of this expanding market. Aluminum production, attracted to the region by low cost hydroelectric power and deep water harbors, is projected to grow very rapidly to meet the demand of national markets, growing at a projected rate of eight percent per year. Among the other components of the industry, the growth of titanium production is expected to be particularly strong, and magnesium processing may also develop. The part of the industry beyond the smelting stage--rolling, drawing, foundries, etc.--should also grow fairly rapidly from its present minor position relative to the basic smelting activities in the region. Primary metals employment is projected to reach over 50,000 by 2020.

Employment in the other manufacturing industries represented about two-fifths of manufacturing employment in 1960. Every one of the 20 major manufacturing industries, with the exception of tobacco, is represented in the region. Most of these industries are concerned in supplying national and international markets, and it is among these industries that the major manufacturing growth will likely occur over the next five or six decades. Employment in Pacific Northwest manufacturing is projected to double. Regional manufacturing growth over this period will be about one-third greater than the national

rate of growth, and the greatest part of this growth will come from the nonresource oriented activities.

Indicative of the strength of these industries, their total employment has grown more than five percent per year since 1960. Growth in machinery, electrical equipment, transportation equipment, and instruments, representing almost two-thirds of the employment in these industries, has exceeded seven percent per year since 1960.

By far the largest industry in this group is the transportation equipment industry. The Boeing Company, which dominates this industry, now produces about 65 percent of all commercial jet aircraft produced in the world. It is projected to retain its competitive position in a market predicted to quadruple by 1980.

Some of the other industries in this group have expectations no less buoyant, although their achievements to date have not been nearly so impressive. The increasing industrialization of the area, the growing tendency toward the uniformity of industrial mix, improved transportation, and the livability of the area are all factors encouraging the growth of these industries. In machinery, electrical and electronic equipment, and the instrument industry there are already a number of firms competing strongly in world markets, and these industries will grow at a rapid rate in the future as technological progress builds a more mechanized and automated economy.

National projections indicate that the noncommodity industries will grow from about 65 percent to 77 percent of the nation's total employment by 2020. In the region, similar changes are projected; noncommodity industries will rise from about 68 percent in 1960 to 77 percent of total employment in 2020.

The noncommodity industries include construction, transportation, communication and utilities, trade, finance and real estate, services, and government. These industries are growing faster, in terms of employment, than the commodity industries primarily because of the rapid gains in productivity in the commodity industries. Commodity production is expanding at rates comparable with the economy's growing income, but not as fast as product per worker, making an increasing proportion of the labor force available to the noncommodity industries.

A comparison of the composition of regional employment in 1940 with that of 1960 shows how the economy has been changing. All the noncommodity industries, except transportation and utilities, grew substantially in their share of total employment

over this period, and similar advances may be anticipated in the future.

Construction has been particularly strong in the Pacific Northwest historically, partly attributable to water resource development. The future rapid growth of the region will assure the continued high levels of activities in this industry.

As the economy has become more affluent and more efficient in production, increasing emphasis has been placed on trade and services, particularly the latter. It is in this area that the greatest expansion is likely to occur. Medical services have been increasing at a high rate in recent years and demand for better and more extensive medical services will grow as people are better able to afford them. Education is another area of strong growth as both the need for education and the ability to pay for it increase. All kinds of personal services and a multitude of business services are rapidly finding new demands.

Recreation will also be an important stimulus to these industries. Higher incomes, more leisure time, and greater mobility will greatly increase the demand for all kinds of recreation--touring, boating, fishing, hunting, skiing. This growth will cause increased demands for lodgings, restaurants, automobile services, equipment rentals, and a host of other activities.

Tables 81 through 94 present the present and projected economic characteristics for the United States, the Columbia-North Pacific Region and its 12 subregion.

The study projections are generally to be considered as conditional forecasts of the future. They are generally based upon extension of past relationships believed to have future relevance for the measure being projected. The reasoning underlying the extension of past relationships comprise the assumptions that make the projections conditional forecasts. If the assumptions are not correct or offsetting in their effect on the overall aggregates, the projections will not be realized.

The purpose of the projections is to enable decision makers to anticipate future economic conditions, identify developing and potential problem areas, and take such corrective action as may be warranted to solve the problems. The corrective actions, in and of themselves, may cause the actual situation in the future to be different than that projected.



Table 81 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, United States

| Item  | 1960 <sup>1/</sup> | 1980        | 2000          | 2020          |
|---|--------------------|-------------|---------------|---------------|
| Population                                    | 179,323,175        | 234,193,000 | 306,757,000   | 397,562,000   |
| Participation Rate (empl/pop)                 | .3701              | .3950       | .3998         | .4003         |
| Total Employment                              | 66,372,649         | 92,712,000  | 122,663,000   | 159,178,000   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 4,469,625          | 3,271,000   | 2,505,000     | 1,897,000     |
| Mining  | 674,662            | 607,000     | 589,000       | 577,000       |
| Manufacturing                                 | 18,244,900         | 23,392,000  | 28,275,000    | 34,366,000    |
| Paper & Allied Products                       | 602,535            | 849,000     | 1,106,000     | 1,396,000     |
| Petroleum                                     | 294,054            | 208,000     | 151,000       | 107,000       |
| Chemicals & Allied Products                   | 902,114            | 1,308,000   | 1,839,000     | 2,501,000     |
| Food & Kindred Products                       | 1,898,661          | 1,871,000   | 1,859,000     | 1,848,000     |
| Primary Metals                                | 1,272,286          | 1,467,000   | 1,600,000     | 1,750,000     |
| Other Manufacturing                           | 13,275,250         | 17,689,000  | 21,720,000    | 26,764,000    |
| Non-commodity <sup>2/</sup>                   | 42,983,462         | 65,442,000  | 91,294,000    | 122,338,000   |
| Total Personal Income<br>(000 - 1958 dollars) | 419,628,723        | 963,000,000 | 2,196,684,000 | 4,934,146,000 |
| Per Capita Income<br>(1958 dollars)           | 2,258              | 4,112       | 7,161         | 12,411        |
| Total Earnings<br>(000 - 1958 dollars)        | 340,680,000        | 749,158,000 | 1,670,268,000 | 3,718,754,000 |
| Earnings per Worker<br>(1958 dollars)         | 5,045              | 8,080       | 13,615        | 23,360        |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.



Table 82 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Columbia-North Pacific Region

| Item  | 1960 <sup>1/</sup> | 1980       | 2000       | 2020        |
|---|--------------------|------------|------------|-------------|
| Population                                    | 5,426,108          | 7,293,880  | 9,710,083  | 12,680,299  |
| Participation Rate (empl/pop)                 | .365               | .393       | .398       | .400        |
| Total Employment                              | 1,978,756          | 2,868,894  | 3,866,015  | 5,067,045   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 167,439            | 149,108    | 126,737    | 104,282     |
| Agriculture                                   | 155,767            | 120,000    | 109,100    | 90,000      |
| Mining  | 11,418             | 12,000     | 11,000     | 9,850       |
| Manufacturing                                 | 447,025            | 627,273    | 796,902    | 995,443     |
| Lumber & Wood Products                        | 143,012            | 104,280    | 84,782     | 73,816      |
| Paper & Allied Products                       | 26,171             | 33,180     | 34,410     | 30,189      |
| Petroleum                                     | 2,824              | 3,056      | 2,974      | 2,478       |
| Chemicals & Allied Products                   | 16,334             | 22,315     | 30,267     | 39,339      |
| Food & Kindred Products                       | 58,903             | 57,471     | 56,342     | 55,896      |
| Primary Metals                                | 19,942             | 39,240     | 53,505     | 53,035      |
| Other Manufacturing                           | 179,839            | 367,731    | 534,622    | 740,690     |
| Non-commodity <sup>2/</sup>                   | 1,352,874          | 2,080,513  | 2,931,376  | 3,957,470   |
| Total Personal Income<br>(000 - 1958 dollars) | 12,981,737         | 29,881,702 | 68,563,235 | 154,437,238 |
| Per Capita Income<br>(1958 dollars)           | 2,325              | 4,097      | 7,061      | 12,179      |
| Total Earnings<br>(000 - 1958 dollars)        | 9,558,311          | 23,263,268 | 51,681,849 | 114,560,277 |
| Earnings per Worker<br>(1958 dollars)         | 4,830              | 8,109      | 13,368     | 22,609      |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

Table 83 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 1

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020       |
|---|--------------------|-----------|-----------|------------|
| Population                                    | 563,748            | 699,096   | 897,048   | 1,140,364  |
| Participation Rate (empl/pop)                 | .344               | .385      | .396      | .402       |
| Total Employment                              | 193,867            | 268,921   | 354,822   | 458,553    |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 12,053             | 9,432     | 7,304     | 5,563      |
| Agriculture                                   | 10,504             | 7,600     | 6,300     | 5,200      |
| Mining  | 8,346              | 7,200     | 5,800     | 4,900      |
| Manufacturing                                 | 32,764             | 41,661    | 49,937    | 59,533     |
| Lumber & Wood Products                        | 11,494             | 12,362    | 8,261     | 7,143      |
| Paper & Allied Products                       | 616                | 922       | 1,140     | 1,161      |
| Petroleum                                     | 324                | 372       | 397       | 382        |
| Chemicals & Allied Products                   | 612                | 844       | 1,186     | 1,634      |
| Food & Kindred Products                       | 4,539              | 3,610     | 3,213     | 3,325      |
| Primary Metals                                | 7,709              | 8,930     | 9,275     | 8,535      |
| Other Manufacturing                           | 32                 | D         | D         | D          |
| Non-commodity <sup>2/</sup>                   | 140,704            | 210,628   | 291,781   | 388,557    |
| Total Personal Income<br>(000 - 1958 dollars) | 1,186,638          | 2,759,321 | 6,112,972 | 13,241,159 |
| Per Capita Income<br>(1958 dollars)           | 2,057              | 3,947     | 6,814     | 11,611     |
| Total Earnings<br>(000 - 1958 dollars)        | 878,636            | 2,112,749 | 4,635,154 | 9,955,028  |
| Earnings per Worker<br>(1958 dollars)         | 4,532              | 7,856     | 13,063    | 21,710     |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income 1962 and earnings 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.

Table 84 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 2

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|---|--------------------|-----------|-----------|-----------|
| Population                                    | 193,594            | 253,043   | 334,019   | 431,271   |
| Participation Rate (empl/pop)                 | .364               | .390      | .400      | .400      |
| Total Employment                              | 70,546             | 98,687    | 133,608   | 172,508   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 14,713             | 14,374    | 12,948    | 11,114    |
| Agriculture                                   | 14,411             | 12,300    | 11,900    | 10,400    |
| Mining  | 289                | 260       | 220       | 200       |
| Manufacturing                                 | 8,255              | 10,865    | 13,344    | 16,265    |
| Lumber & Wood Products                        | 3,325              | 3,003     | 2,469     | 2,055     |
| Paper & Allied Products                       | 193                | 83        | 76        | 79        |
| Petroleum                                     | ---                | ---       | ---       | ---       |
| Chemicals & Allied Products                   | 481                | 615       | 767       | 919       |
| Food & Kindred Products                       | 1,022              | 1,386     | 1,404     | 1,478     |
| Primary Metals                                | 743                | 2,595     | 3,245     | 3,370     |
| Other Manufacturing                           | 8                  | D         | D         | D         |
| Non-commodity <sup>2/</sup>                   | 47,289             | 73,188    | 107,096   | 144,929   |
| Total Personal Income<br>(000 - 1958 dollars) | 446,751            | 1,040,513 | 2,391,910 | 5,352,504 |
| Per Capita Income<br>(1958 dollars)           | 2,271              | 4,112     | 7,161     | 12,411    |
| Total Earnings<br>(000 - 1958 dollars)        | 327,339            | 797,391   | 1,819,073 | 4,029,787 |
| Earnings per Worker<br>(1958 dollars)         | 4,640              | 8,080     | 13,615    | 23,360    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income 1962 and earnings 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.

Table 85 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 3

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|---|--------------------|-----------|-----------|-----------|
| Population                                    | 227,649            | 280,732   | 355,204   | 443,728   |
| Participation Rate (empl/pop)                 | .349               | .371      | .380      | .390      |
| Total Employment                              | 79,496             | 104,239   | 134,978   | 173,054   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 15,554             | 15,131    | 13,478    | 11,455    |
| Agriculture                                   | 15,461             | 12,800    | 12,200    | 10,500    |
| Mining  | 150                | 190       | 120       | 110       |
| Manufacturing                                 | 15,053             | 19,120    | 23,075    | 27,593    |
| Lumber & Wood Products                        | 1,257              | 1,981     | 1,741     | 1,570     |
| Paper & Allied Products                       | 382                | 254       | 300       | 306       |
| Petroleum                                     | ---                | ---       | ---       | ---       |
| Chemicals & Allied Products                   | 7,529              | 9,400     | 11,632    | 13,982    |
| Food & Kindred Products                       | 3,329              | 3,243     | 3,136     | 3,130     |
| Primary Metals                                | 34                 | 70        | 190       | 240       |
| Other Manufacturing                           | 23                 | D         | D         | D         |
| Non-commodity <sup>2/</sup>                   | 48,739             | 69,798    | 98,305    | 133,896   |
| Total Personal Income<br>(000 - 1958 dollars) | 518,774            | 1,108,791 | 2,437,816 | 5,322,167 |
| Per Capita Income<br>(1958 dollars)           | 2,230              | 3,950     | 6,863     | 11,994    |
| Total Earnings<br>(000 - 1958 dollars)        | 371,434            | 882,040   | 1,874,325 | 3,989,604 |
| Earnings per Worker<br>(1958 dollars)         | 4,672              | 8,462     | 13,886    | 23,054    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income 1962 and earnings 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.

Table 86 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 4

| Item  | 1960 1/ | 1980      | 2000      | 2020      |
|---|---------|-----------|-----------|-----------|
| Population                                    | 277,249 | 350,870   | 450,542   | 576,000   |
| Participation Rate (empl/pop)                 | .353    | .380      | .393      | .400      |
| Total Employment                              | 97,960  | 133,402   | 176,999   | 230,337   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 22,218  | 19,885    | 16,934    | 13,945    |
| Agriculture                                   | 21,910  | 16,600    | 15,300    | 12,800    |
| Mining  | 174     | 530       | 670       | 670       |
| Manufacturing                                 | 10,169  | 14,217    | 19,348    | 25,001    |
| Lumber & Wood Products                        | 355     | 297       | 240       | 200       |
| Paper & Allied Products                       | 101     | 76        | 227       | 454       |
| Petroleum                                     | 23      | D         | D         | D         |
| Chemicals & Allied Products                   | 2,426   | 3,653     | 4,337     | 6,359     |
| Food & Kindred Products                       | 4,773   | 6,105     | 6,111     | 5,769     |
| Primary Metals                                | 44      | 140       | 280       | 350       |
| Other Manufacturing                           | 36      | D         | D         | D         |
| Non-commodity <sup>2/</sup>                   | 65,399  | 98,770    | 140,047   | 190,721   |
| Total Personal Income<br>(000 - 1958 dollars) | 541,700 | 1,216,921 | 2,707,857 | 6,057,552 |
| Per Capita Income<br>(1958 dollars)           | 1,938   | 3,468     | 6,010     | 10,517    |
| Total Earnings<br>(000 - 1958 dollars)        | 410,710 | 964,433   | 2,083,998 | 4,573,311 |
| Earnings per Worker<br>(1958 dollars)         | 4,193   | 7,230     | 11,774    | 19,855    |

1/ Estimated from Census of Population and Office of Business Economics data. Data for income 1962 and earnings 1959.

2/ Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.



Table 87 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 5

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|---|--------------------|-----------|-----------|-----------|
| Population                                    | 252,430            | 328,695   | 430,400   | 553,476   |
| Participation Rate (empl/pop)                 | .374               | .409      | .416      | .417      |
| Total Employment                              | 94,350             | 134,551   | 178,868   | 230,721   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 18,372             | 16,951    | 14,856    | 12,544    |
| Agriculture                                   | 17,861             | 13,700    | 12,800    | 11,100    |
| Mining  | 193                | 220       | 180       | 160       |
| Manufacturing                                 | 11,565             | 16,100    | 20,463    | 25,538    |
| Lumber & Wood Products                        | 2,539              | 3,167     | 2,707     | 2,374     |
| Paper & Allied Products                       | 51                 | 222       | 479       | 822       |
| Petroleum                                     | 5                  | D         | D         | D         |
| Chemicals & Allied Products                   | 205                | D         | D         | D         |
| Food & Kindred Products                       | 5,287              | 4,653     | 4,588     | 4,372     |
| Primary Metals                                | 80                 | 75        | 225       | 300       |
| Other Manufacturing                           | 16                 | D         | D         | D         |
| Non-commodity <sup>2/</sup>                   | 64,220             | 101,280   | 143,369   | 192,479   |
| Total Personal Income<br>(000 - 1958 dollars) | 543,596            | 1,263,503 | 2,912,517 | 6,559,798 |
| Per Capita Income<br>(1958 dollars)           | 2,080              | 3,844     | 6,767     | 11,852    |
| Total Earnings<br>(000 - 1958 dollars)        | 394,086            | 1,016,299 | 2,262,511 | 4,997,503 |
| Earnings per Worker<br>(1958 dollars)         | 4,177              | 7,553     | 12,649    | 21,660    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income 1962 and earnings 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.

Table 88 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 6

| Item  | 1960 <sup>1/</sup> | 1980    | 2000      | 2020      |
|---|--------------------|---------|-----------|-----------|
| Population                                    | 155,991            | 193,456 | 234,641   | 274,324   |
| Participation Rate (empl/pop)                 | .356               | .377    | .390      | .414      |
| Total Employment                              | 55,600             | 72,933  | 91,510    | 113,618   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 10,750             | 8,579   | 6,687     | 5,140     |
| Agriculture                                   | 10,229             | 7,400   | 6,100     | 4,900     |
| Mining  | 251                | 480     | 420       | 360       |
| Manufacturing                                 | 9,311              | 12,248  | 15,060    | 18,364    |
| Lumber & Wood Products                        | 6,095              | 5,094   | 3,824     | 2,865     |
| Paper & Allied Products                       | 979                | 841     | 784       | 752       |
| Petroleum                                     | ---                | ---     | ---       | ---       |
| Chemicals & Allied Products                   | 92                 | D       | D         | D         |
| Food & Kindred Products                       | 1,040              | 1,002   | 979       | 892       |
| Primary Metals                                | 16                 | 45      | 120       | 150       |
| Other Manufacturing                           | 9                  | D       | D         | D         |
| Non-commodity <sup>2/</sup>                   | 35,288             | 51,626  | 69,343    | 89,754    |
| Total Personal Income<br>(000 - 1958 dollars) | 325,720            | 729,348 | 1,555,513 | 3,263,627 |
| Per Capita Income<br>(1958 dollars)           | 2,032              | 3,770   | 6,629     | 11,897    |
| Total Earnings<br>(000 - 1958 dollars)        | 258,333            | 594,537 | 1,283,070 | 2,711,048 |
| Earnings per Worker<br>(1958 dollars)         | 4,646              | 8,152   | 14,021    | 23,861    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.

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PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6  
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)  
JAN 71 J BOOTH, R DAWSON, A M GRANO

UNCLASSIFIED

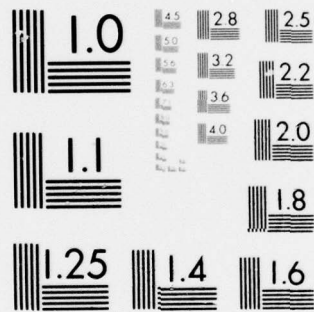
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Table 89 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 7

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|---|--------------------|-----------|-----------|-----------|
| Population                                    | 198,665            | 251,430   | 321,868   | 404,373   |
| Participation Rate (empl/pop)                 | .368               | .400      | .400      | .400      |
| Total Employment                              | 73,054             | 100,572   | 128,747   | 161,749   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 12,465             | 10,863    | 9,149     | 7,521     |
| Agriculture                                   | 11,753             | 8,900     | 8,400     | 6,800     |
| Mining  | 187                | 90        | 100       | 110       |
| Manufacturing                                 | 12,678             | 19,276    | 24,848    | 31,455    |
| Lumber & Wood Products                        | 6,926              | 6,072     | 5,081     | 4,427     |
| Paper & Allied Products                       | 433                | 884       | 1,142     | 1,022     |
| Petroleum                                     | ---                | ---       | ---       | ---       |
| Chemicals & Allied Products                   | 93                 | D         | D         | D         |
| Food & Kindred Products                       | 2,741              | 3,047     | 2,931     | 2,846     |
| Primary Metals                                | 505                | 1,270     | 1,960     | 2,050     |
| Other Manufacturing                           | 120                | D         | D         | D         |
| Non-commodity <sup>2/</sup>                   | 47,724             | 70,343    | 94,650    | 122,663   |
| Total Personal Income<br>(000 ~ 1958 dollars) | 453,444            | 1,039,347 | 2,326,301 | 5,065,945 |
| Per Capita Income<br>(1958 dollars)           | 2,237              | 4,134     | 7,228     | 12,528    |
| Total Earnings<br>(000 ~ 1958 dollars)        | 359,722            | 832,331   | 1,816,824 | 3,890,979 |
| Earnings per Worker<br>(1958 dollars)         | 4,924              | 8,276     | 14,112    | 24,056    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.



Table 90 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 8

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|---|--------------------|-----------|-----------|-----------|
| Population                                    | 224,486            | 277,906   | 349,369   | 441,324   |
| Participation Rate (empl/pop)                 | .346               | .390      | .398      | .398      |
| Total Employment                              | 77,736             | 108,295   | 139,027   | 175,440   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 5,490              | 4,385     | 3,408     | 2,600     |
| Agriculture                                   | 4,876              | 3,600     | 3,300     | 2,500     |
| Mining  | 75                 | 250       | 230       | 220       |
| Manufacturing                                 | 28,111             | 37,811    | 45,629    | 54,654    |
| Lumber & Wood Products                        | 11,927             | 8,560     | 7,012     | 5,694     |
| Paper & Allied Products                       | 7,280              | 9,224     | 9,578     | 8,172     |
| Petroleum                                     | 93                 | D         | D         | D         |
| Chemicals & Allied Products                   | 209                | 232       | 349       | 489       |
| Food & Kindred Products                       | 2,264              | 2,110     | 2,082     | 2,095     |
| Primary Metals                                | 1,630              | 4,665     | 6,730     | 6,740     |
| Other Manufacturing                           | 830                | 880       | 923       | 924       |
| Non-commodity <sup>2/</sup>                   | 44,060             | 63,849    | 89,760    | 117,966   |
| Total Personal Income<br>(000 - 1958 dollars) | 502,070            | 1,114,890 | 2,453,383 | 5,422,555 |
| Per Capita Income<br>(1958 dollars)           | 2,165              | 4,012     | 7,022     | 12,287    |
| Total Earnings<br>(000 - 1958 dollars)        | 360,216            | 883,496   | 1,925,386 | 4,114,192 |
| Earnings per Worker<br>(1958 dollars)         | 4,634              | 8,158     | 13,849    | 23,451    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.  
D = Too small to be projected but included in regional totals.

Table 91 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 9

| Item  | 1960 <sup>1/</sup> | 1980      | 2000       | 2020       |
|---|--------------------|-----------|------------|------------|
| Population                                    | 1,168,899          | 1,727,266 | 2,397,552  | 3,237,150  |
| Participation Rate (empl/pop)                 | .369               | .393      | .396       | .395       |
| Total Employment                              | 431,094            | 679,650   | 949,329    | 1,279,940  |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 23,336             | 20,489    | 17,217     | 13,987     |
| Agriculture                                   | 21,714             | 16,000    | 14,700     | 11,200     |
| Mining  | 525                | 800       | 900        | 900        |
| Manufacturing                                 | 97,333             | 155,401   | 202,847    | 259,721    |
| Lumber & Wood Products                        | 34,796             | 23,226    | 19,527     | 17,949     |
| Paper & Allied Products                       | 5,310              | 7,607     | 7,060      | 5,782      |
| Petroleum                                     | 424                | 670       | 589        | 474        |
| Chemicals & Allied Products                   | 1,746              | 2,683     | 4,037      | 5,655      |
| Food & Kindred Products                       | 12,884             | 12,197    | 11,916     | 11,928     |
| Primary Metals                                | 4,634              | 9,100     | 14,770     | 15,615     |
| Other Manufacturing                           | 2,386              | 2,744     | 2,879      | 2,881      |
| Non-commodity <sup>2/</sup>                   | 309,900            | 502,960   | 728,356    | 1,005,332  |
| Total Personal Income<br>(000 - 1958 dollars) | 2,834,742          | 7,212,156 | 17,011,988 | 39,774,867 |
| Per Capita Income<br>(1958 dollars)           | 2,328              | 4,175     | 7,096      | 12,287     |
| Total Earnings<br>(000 - 1958 dollars)        | 2,084,525          | 5,733,281 | 13,278,835 | 29,635,678 |
| Earnings per Worker<br>(1958 dollars)         | 4,835              | 8,436     | 13,988     | 23,154     |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

Table 92 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 10

| Item  | 1960 <sup>1/</sup> | 1980      | 2000      | 2020      |
|---|--------------------|-----------|-----------|-----------|
| Population                                    | 381,384            | 465,482   | 575,416   | 708,879   |
| Participation Rate (empl/pop)                 | .346               | .391      | .404      | .408      |
| Total Employment                              | 131,780            | 182,129   | 232,242   | 289,106   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 10,236             | 9,562     | 8,533     | 7,284     |
| Agriculture                                   | 8,117              | 7,100     | 6,500     | 5,400     |
| Mining  | 467                | 250       | 230       | 190       |
| Manufacturing                                 | 45,184             | 62,399    | 78,444    | 96,837    |
| Lumber & Wood Products                        | 35,891             | 22,770    | 18,686    | 16,505    |
| Paper & Allied Products                       | 1,472              | 2,756     | 2,728     | 2,288     |
| Petroleum                                     | 27                 | D         | D         | D         |
| Chemicals & Allied Products                   | 53                 | D         | D         | D         |
| Food & Kindred Products                       | 3,973              | 4,211     | 4,034     | 3,715     |
| Primary Metals                                | 214                | 2,465     | 5,290     | 5,440     |
| Other Manufacturing                           | 12                 | D         | D         | D         |
| Non-commodity <sup>2/</sup>                   | 75,893             | 109,918   | 145,035   | 184,795   |
| Total Personal Income<br>(000 - 1958 dollars) | 769,633            | 1,652,375 | 3,600,986 | 7,794,152 |
| Per Capita Income<br>(1958 dollars)           | 2,034              | 3,550     | 6,258     | 10,995    |
| Total Earnings<br>(000 - 1958 dollars)        | 608,942            | 1,307,079 | 2,787,999 | 5,924,586 |
| Earnings per Worker<br>(1958 dollars)         | 4,621              | 7,177     | 12,005    | 20,493    |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.

Table 93 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 11

| Item  | 1960 <sup>1/</sup> | 1980       | 2000       | 2020       |
|---|--------------------|------------|------------|------------|
| Population                                    | 1,768,117          | 2,449,653  | 3,345,317  | 4,448,089  |
| Participation Rate (empl/pop)                 | .378               | .400       | .400       | .399       |
| Total Employment                              | 667,745            | 978,681    | 1,338,231  | 1,773,299  |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 20,973             | 18,242     | 15,069     | 12,116     |
| Agriculture                                   | 17,824             | 13,000     | 10,700     | 8,400      |
| Mining  | 681                | 1,700      | 2,100      | 2,000      |
| Manufacturing                                 | 175,244            | 235,907    | 300,898    | 376,586    |
| Lumber & Wood Products                        | 27,198             | 16,944     | 14,670     | 12,601     |
| Paper & Allied Products                       | 9,348              | 10,311     | 10,896     | 9,351      |
| Petroleum                                     | 1,928              | 1,661      | 1,625      | 1,290      |
| Chemicals & Allied Products                   | 2,888              | 4,110      | 5,745      | 7,591      |
| Food & Kindred Products                       | 16,994             | 15,907     | 15,913     | 16,311     |
| Primary Metals                                | 4,328              | 9,875      | 11,410     | 10,235     |
| Other Manufacturing                           | 472                | 585        | 672        | 721        |
| Non-commodity <sup>2/</sup>                   | 470,847            | 722,832    | 1,020,164  | 1,382,597  |
| Total Personal Income<br>(000 - 1958 dollars) | 4,826,380          | 10,675,588 | 24,912,576 | 56,308,358 |
| Per Capita Income<br>(1958 dollars)           | 2,633              | 4,358      | 7,447      | 12,659     |
| Total Earnings<br>(000 - 1958 dollars)        | 3,477,259          | 8,084,786  | 17,808,409 | 40,536,210 |
| Earnings per Worker<br>(1958 dollars)         | 5,207              | 8,261      | 13,307     | 22,859     |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

Table 94 - Economic Characteristics, 1960 with Projections  
to 1980, 2000 and 2020, Subregion 12

| Item  | 1960 1/ | 1980   | 2000    | 2020    |
|---|---------|--------|---------|---------|
| Population                                    | 13,902  | 16,250 | 18,670  | 21,320  |
| Participation Rate (empl/pop)                 | .398    | .421   | .410    | .409    |
| Total Employment                              | 5,528   | 6,834  | 7,654   | 8,720   |
| Agriculture, Forestry & Fishery <sup>2/</sup> | 1,279   | 1,215  | 1,154   | 1,013   |
| Agriculture                                   | 1,107   | 1,000  | 900     | 800     |
| Mining  | 80      | 30     | 30      | 30      |
| Manufacturing                                 | 1,358   | 2,268  | 3,009   | 3,896   |
| Lumber & Wood Products                        | 1,209   | 804    | 564     | 433     |
| Paper & Allied Products                       | 6       | D      | D       | D       |
| Petroleum                                     | ---     | ---    | ---     | ---     |
| Chemicals & Allied Products                   | ---     | ---    | ---     | ---     |
| Food & Kindred Products                       | 57      | 35     | 35      | 35      |
| Primary Metals                                | 5       | 10     | 10      | 10      |
| Other Manufacturing                           | ---     | ---    | ---     | ---     |
| Non-commodity <sup>2/</sup>                   | 2,811   | 3,321  | 3,461   | 3,781   |
| Total Personal Income<br>(000 - 1958 dollars) | 32,288  | 68,949 | 139,416 | 274,554 |
| Per Capita Income<br>(1958 dollars)           | 2,459   | 4,243  | 7,467   | 12,878  |
| Total Earnings<br>(000 - 1958 dollars)        | 27,109  | 54,846 | 106,265 | 202,351 |
| Earnings per Worker<br>(1958 dollars)         | 4,904   | 8,025  | 13,884  | 23,205  |

<sup>1/</sup> Estimated from Census of Population and Office of Business Economics data. Data for income, 1962, and earnings, 1959.

<sup>2/</sup> Includes some agricultural and forestry management.

D = Too small to be projected but included in regional totals.



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## A D D E N D U M

### COMPARISON OF THE ECONOMIC PROJECTIONS

The economic projections in this appendix--a "Type 1" study--are based on the projections which were transmitted by the Economics Committee, Water Resources Council, in March, 1968. The "Type 1" study projections were made by the Regional Economics Division, Office of Business Economics, and the Economic Research Service and Forest Service (OBERS). They differ to some degree from the economic projections for the Willamette Basin "Type 2" study, completed during August, 1966, and the Puget Sound and Adjacent Waters "Type 2" study, completed late in 1967.

A comparison of economic projections developed for the C-NP "Type 1" study and the Willamette and Puget Sound "Type 2" studies, in terms of their differences, assumptions and methodologies, were presented in the economic appendices of the "Type 2" studies. The following sections are based on the presentations from the "Type 2" economics appendices.

In both the "Type 1" and "Type 2" studies, it is recognized that regional growth will be dependent upon future national and regional economic opportunities. The level of future regional population will respond to these opportunities, or lack thereof. The "Type 1" and "Type 2" studies therefore, project regional employment opportunities, and then regional population. Other measures of economic growth were also included.

#### Willamette Basin Comparisons

The following tabulations present the differences between major economic parameters for the Willamette from the two studies:

|                  | <u>1960</u> | <u>1980</u>             | <u>2000</u> | <u>2020</u> |
|------------------|-------------|-------------------------|-------------|-------------|
|                  |             | <u>Total Employment</u> |             |             |
| Willamette       | 455,606     | 652,700                 | 803,300     | 1,306,600   |
| OBERS            | 431,094     | 679,650                 | 949,329     | 1,279,940   |
| Difference       | +24,512     | -26,950                 | -66,029     | +26,660     |
| Percent of OBERS | +5.69       | -3.97                   | -6.96       | +2.08       |



|                  | <u>1960</u>       | <u>1980</u> | <u>2000</u> | <u>2020</u> |
|------------------|-------------------|-------------|-------------|-------------|
|                  | <u>Population</u> |             |             |             |
| Willamette       | 1,168,899         | 1,767,500   | 2,422,000   | 3,591,000   |
| OBERS (prelim.)  | 1,168,899         | 1,727,267   | 2,397,553   | 3,237,150   |
| Difference       | --                | +40,233     | +24,447     | +353,850    |
| Percent of OBERS | --                | +2.3        | +1.0        | +10.9       |

|                 | <u>Per Capita Income (1960 Dollars)</u> |         |         |          |
|-----------------|---|---------|---------|----------|
| Willamette      | \$2,357                                 | \$3,665 | \$5,665 | \$ 8,700 |
| OBERS (prelim.) | <u>1/</u>                               | 4,312   | 7,329   | 12,691   |
| Difference      | --                                      | -647    | -1,664  | -3,991   |

#### Assumptions and Methodologies

The use of different data is one source of disparity between the two studies. The "Type 2" study measured employment using "establishment" data, tabulated geographically by the site of employing establishment. Data were obtained from the U. S. Bureau of Labor Statistics and State Departments of Employment and are annual averages; basin data and regional data, including Idaho, Oregon, Washington, and western Montana were used. The OBERS study used U.S. Bureau of Census "household" data, geographic data of worker residence as recorded for April 1 of decennial census years. Data used for the "Type 2" study had the advantage of giving more industrial detail for the area and subarea analysis; production data, relating to the "establishment" data, reinforced the analysis. Total employment as measured in this study exceeded that of the OBERS study by about 5.7 percent in 1960; presumably the projections are similarly affected.

Differences in methodology and assumptions also affect the results. In both studies, future levels of gross national product and national population are assumed (or separately derived) as important parameters of regional growth. The two studies assume closely comparable future levels of GNP, but their assumptions of national population growth differ. The assumed national population level for 2020 is about 17 percent higher in the "Type 2" study than the OBERS figure. The OBERS study assumes lower future fertility rates than the Willamette "Type 2" study. Employment projections of the "Type 2" study undoubtedly reflect the higher national population assumptions, but the differences in the two methodologies prevent a direct measure.

1/ Approximately the same as the Willamette E.B.S. figure: 1959-\$2,281; 1962-\$2,405 (both in 1960 dollars).



In the Willamette "Type 2" study, projections were made of production and employment for each of the "base" or commodity-producing industries studied. Employment projections were then made for the noncommodity-producing industries, and also for the federal government and armed forces. The "Type 1" study uses a variant of the "shift-share" analysis to make regional projections. The "Type 1" study first develops individual industry projections for the nation by breaking down GNP projections. Each industry's employment is then allocated to 167 subnational "economic areas" on the basis of the historical trends in the regional components of "shift-share" analysis. Residentiary industries are projected in the same way and are then adjusted to derive the national and local employment base. These data for "economic areas" are then allocated into the more than 200 water resource areas.

The methodological differences between the studies cannot be directly quantified; but the comparison of the employment projections indicated that the "Type 2" study method, given the differences in basic data and assumptions, resulted in somewhat lower results than would have been obtained under the OBERS procedures. The differences, however, are small considering the time period involved.

The population figures in each study were derived by applying labor-force-participation rates to employment projections. Disparate population projections occur because of differences in employment projections and differences in assumed participation rates.

Labor-force-participation trends were analyzed in each study, and future anticipated trends were projected. The "Type 2" study assumed modest progressive reduction in the civilian labor force participation rate throughout the study period. The OBERS study, on the other hand, assumed slight increases in labor-force-participation throughout the projection period. The OBERS assumption is based primarily upon a more recent Bureau of Labor Statistics study <sup>1/</sup>, which forecasted rising participation rates traceable mainly to increasing employment rates of females.

Differences in per capita personal income projections are largely explainable in terms of projected national figures based on different assumptions. Differences in index years and projection methods also account for some of the differences.

In the "Type 2" study, per capita income is estimated to

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<sup>1/</sup> Cooper, Sophia and Denis F. Johnston, "Labor Force Projections for 1970-80", Monthly Labor Review, February 1965.

increase approximately 2.2 percent annually during the projection period. In the OBERS study, it is assumed that per capita personal income will increase at a more rapid rate--2.9 percent.

The OBERS study projected personal income by first projecting national totals in terms of GNP. Regional projections were then made by allocation methods similar to procedures used for employment. In the "Type 2" study national totals, obtained from Water Resources Council, were used, and per capita incomes were projected from national assumptions. In the "Type 2" study, population figures were then applied to develop total personal incomes.

Although the economic parameters projected by the two studies differ, particularly in the latter years, they are reasonably consistent in view of the projection period, and they may be considered as satisfactory for water resource planning purposes.

#### Puget Sound Comparisons

The following tabulations present the differences between major economic parameters for the Puget Sound and Adjacent Waters from the two studies:

|                  | <u>1980</u> | <u>2000</u>             | <u>2020</u> |
|------------------|-------------|-------------------------|-------------|
|                  |             | <u>Total Employment</u> |             |
| PSAW             | 973,100     | 1,535,400               | 2,434,400   |
| OBERS (prelim.)  | 978,681     | 1,338,231               | 1,773,299   |
| Difference       | -5,581      | +197,169                | +661,101    |
| Percent of OBERS | -0.6        | +14.7                   | +37.3       |
|                  |             | <u>Population</u>       |             |
| PSAW             | 2,726,900   | 4,300,500               | 6,809,400   |
| OBERS (prelim.)  | 2,449,700   | 3,345,300               | 4,448,100   |
| Difference       | +277,200    | +955,200                | +2,361,300  |
| Percent of OBERS | +11.3       | +28.6                   | +53.1       |

The projections are fairly similar for the period up to 1980. However, as they extend forward to the years 2000 and 2020, the projections for the "Type 2" study increase at a faster rate and the differences increase. By 2020, the "Type 2" projections indicate 37 percent more employment and 53 percent more population.

### Assumptions and Methodologies

Generally, most of the assumptions made in the "Type 1" and "Type 2" studies are quite similar. However, there is a divergence in some major assumptions. The assumptions concerning population for the United States are presented in the following tabulation:

|                  | <u>1980</u> | <u>2000</u> | <u>2020</u> |
|------------------|-------------|-------------|-------------|
| PSAW (000)       | 259,584     | 338,219     | 469,126     |
| OBERS (000)      | 234,193     | 306,757     | 397,562     |
| Percent of OBERS | +10.8       | +10.3       | +18.0       |

The directional effect of this assumption is to provide for higher population and employment projections in the "Type 2" study.

Another reason for the differences is the procedures utilized to estimate the future levels of economic activity. The procedures used by OBERS have already been discussed in the section on the Willamette Basin. The "Type 2" study for the Puget Sound utilized an interindustry input-output model to develop projections for the 1963 to 1980 period. The 1963 to 1980 growth rates were then extended to the years 2000 and 2020. The projected growth rate for the 1963 to 1980 period was substantially greater than the longer term growth rates used in OBERS. Consequently, the "Type 2" procedure results in substantially higher projections for the latter two projection years.

As in the Willamette Basin, sources of base data and base years for the two studies were different for some economic parameters. Disparate population projections also occur because of differences in employment projections and the differences in the assumed participation rates. In addition, both studies relied on "substantial judgement" for making modifications of the projections, especially for the years 2000 and 2020. All of these factors have contributed to the differences in the projections for the Puget Sound.

A more detailed discussion on the projections, assumptions, and procedures used for each of the aforementioned studies can be found in the economic appendices for the "Type 2" studies.

PARTICIPATING STATES AND AGENCIES

STATES

|         |        |            |         |
|---------|--------|------------|---------|
| Idaho   | Nevada | Utah       | Wyoming |
| Montana | Oregon | Washington |         |

FEDERAL AGENCIES

|                                  |                                 |
|----------------------------------|---------------------------------|
| Department of Agriculture        | Department of Housing &         |
| Economic Research Service        | Urban Development               |
| Forest Service                   | Department of Transportation    |
| Soil Conservation Service        | Department of the Interior      |
| Department of the Army           | Bonneville Power Adm.           |
| Corps of Engineers               | Bureau of Indian Affairs        |
| Department of Commerce           | Bureau of Land Management       |
| Economic Development Adm.        | Bureau of Mines                 |
| National Oceanic & Atmospheric   | Bureau of Outdoor Recreation    |
| Administration                   | Bureau of Reclamation           |
| National Weather Service         | Fish and Wildlife Service       |
| National Marine Fisheries        | Geological Survey               |
| Service                          | National Park Service           |
| Department of Health, Education, | Department of Labor             |
| & Welfare                        | Environmental Protection Agency |
| Public Health Service            | Federal Power Commission        |



